
Sparton Technology, Inc. Former Coors Road Plant Remedial Program

2019 Annual Report



S.S. PAPADOPULOS & ASSOCIATES, INC.
Environmental & Water-Resource Consultants

June 30, 2020

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June 30, 2020

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**Subject: Sparton Technology, Inc: Former Coors Road Plant Remedial Program
2019 Annual Report**

Ladies and Gentlemen:

On behalf of Sparton Technology, Inc. (Sparton), S.S. Papadopoulos & Associates, Inc. (SSP&A) is pleased to submit the subject report. The report presents data collected at Sparton's former Coors Road Plant during the operation of the remedial systems in 2019 and evaluations of these data to assess the performance of the systems.

We certify under penalty of law that this document and all attachments were prepared under our direction and supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based upon our inquiry of either the person or persons who manage the system and/or the person or persons directly responsible for gathering the information, the information submitted is, to the best of our knowledge and belief,

United States Environmental Protection Agency
New Mexico Environment Department
June 30, 2020
Page 2

true, accurate, and complete. We further certify, to the best of our knowledge and belief, that this document is consistent with the applicable requirements of the Consent Decree entered among the New Mexico Environment Department, the U.S. Environmental Protection Agency, Sparton Technology, Inc., and others in connection with Civil Action No. CIV 97 0206 LH/JHG, United States District Court for the District of New Mexico. We are aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If you have any questions concerning the report, please contact us.

Sincerely,

S.S. PAPADOPULOS & ASSOCIATES, INC.

A blue ink signature of Stavros S. Papadopoulos, written in a cursive style.

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Alex Spiliotopoulos, PhD
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Sparton Technology, Inc. Former Coors Road Plant Remedial Program

2019 Annual Report

Prepared for:

**Sparton Technology, Inc.
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Prepared by:



S.S. PAPADOPULOS & ASSOCIATES, INC.
Environmental & Water-Resource Consultants

June 30, 2020

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List of Acronyms

µg/L	Micrograms per liter
COA	City of Albuquerque
Cr	Chromium
DCE	1,1-Dichloroethylene
DFZ	Deep Flow Zone below the 4800 -- foot clay
dioxane	1,4-dioxane
EA	EA Engineering, Science, and Technology, Inc., PBC
ft	foot or feet
ft MSL	feet above Mean Sea Level
ft/d	feet per day
ft/yr	feet per year
ft ²	square feet
ft ² /d	feet squared per day
ft ³	cubic feet
g/cm ³	grams per cubic centimeter
gpd	gallons per day
gpm	gallons per minute
kg	kilogram
lbs	pounds
LFZ	Lower Flow Zone (ULFZ and LLFZ)
LLFZ	Lower Flow Zone
MCL	Maximum Contaminant Level
Metric	Metric Corporation
mg/L	milligrams per liter
MSL	Mean Sea Level
ND	not detected
NMED	New Mexico Environment Department
NMWQCC	New Mexico Water Quality Control Commission
O/S	On-Site

RFI	RCRA Facility Investigation
rpm	Revolutions per minute
Sparton	Sparton Technology, Inc.
SSP&A	S.S. Papadopoulos & Associates, Inc.
SVE	Soil Vapor Extraction
TCA	1,1,1-Trichloroethane
TCE	Trichloroethylene
UFZ	Upper Flow Zone
ULFZ	Upper Lower Flow Zone
USEPA	United States Environmental Protection Agency
USF	Upper Santa Fe Group
USGS	United States Geological Survey
VC	Vinyl Chloride
VOC	Volatile Organic Compound

REPORT

Section 1

Introduction

The former Coors Road Plant of Sparton Technology, Inc. (Sparton) is located at 9621 Coors Boulevard NW (on the west side of the boulevard), Albuquerque, New Mexico, north of Paseo del Norte and south of the Arroyo de las Calabacillas (see Figure 1.1). Investigations conducted between 1983 and 1987 at and around the plant revealed that on-site soils and groundwater were contaminated by volatile organic compounds (VOCs), primarily trichloroethene (TCE), 1,1,1-trichloroethane (TCA) and 1,1-dichloroethene (DCE), and by chromium, and that contaminated groundwater had migrated beyond the boundaries of the facility to downgradient, off-site areas.

These investigations also indicated that groundwater contamination was primarily within a sandy unit that lies above a 2-4 feet (ft) thick clay unit referred to as the 4,800-ft clay unit. This unit was encountered in every deep well installed during site investigations and in the U. S. Geological Survey (USGS) Hunter Ridge Park 1 Boring about 0.5 mile north of the site. The saturated thickness of the sands above the clay unit is about 160 ft. Beneath the facility, and in an approximately 1,500 ft wide band trending north from the facility, a silty clay unit has been mapped between an elevation of about 4,965 ft above mean sea level (ft MSL) and 4,975 ft MSL. This unit is referred to as the 4,970-ft silt/clay unit. Depending on the depth of their screened interval, wells installed at the site and its vicinity during site investigations, or later, have been referred to as Upper Flow Zone (UFZ) wells if screened across, or within 15 ft of, the water table, Upper Lower Flow Zone (ULFZ) wells if screened 15-45 ft below the water table, Lower Lower Flow Zone (LLFZ) wells if screened more than 45 ft below the water table, and Deep Flow Zone (DFZ) wells if screened below the 4,800-ft clay. The USGS boring also indicates a 15-ft thick clay unit below the DFZ between elevations of 4,705 and 4,720 ft MSL. At the on-site area, the 4,970-ft silt/clay unit separates the UFZ from the ULFZ. Well locations are shown in Figure 1.2 and their screened interval in relation to these flow zones is shown in Figure 1.3.

On March 3, 2000, the United States Environmental Protection Agency (USEPA), the State of New Mexico Environment Department (NMED), the County of San Bernalillo, the City of Albuquerque (COA) and Sparton entered into a Consent Decree that set the terms for addressing soil and groundwater contamination. Under the terms of this Consent Decree, Sparton is currently operating an off-site and a source containment system to address groundwater contamination.¹ The off-site containment system consists of a containment well, CW-1, that fully penetrates the saturated portion of the sand unit above the 4,800-ft clay, a treatment building with an air stripper to treat the pumped water, a pipeline to the nearby Arroyo de las Calabacillas, and an infiltration gallery in the arroyo for returning the treated water to the aquifer (see Figure 1.4).

¹ Under the terms of the Consent Decree, Sparton also operated a Soil Vapor Extraction (SVE) system to address on-site soil contamination; this system was operated for a total of about 372 days between April 10, 2000 and June 15, 2001 and was dismantled in May 2002 after data indicated that the requirements and performance goals of the Consent Decree were met (Chandler and Metric Corp., 2001).

The source containment system also consists of a containment well, CW-2, with a 50-ft screen across the upper part of the sand unit, an on-site treatment building with an air stripper and a chromium removal unit² to treat the pumped water, and pipelines to two on-site ponds³ for returning the treated water to the aquifer (see Figure 1.5).

Prior to the implementation of the remedial measures discussed above, the predominant contaminants at the off-site areas were VOCs, primarily TCE followed by DCE and TCA. In past Annual Reports the initial horizontal extent of these three contaminants was presented in plume maps prepared using November 1998 data from monitoring wells that existed at that time. At the on-site area, these plume maps did not distinguish between shallow wells completed above the 4970-ft silt/clay and deeper wells completed below the 4970-ft silt/clay. After chromium concentrations in the water pumped from the source containment system increased in 2013, and a chromium removal unit was installed to address them in 2014, the USEPA and NMED requested that Sparton in the 2015 and subsequent Annual Reports include maps showing the extent of chromium contamination.⁴ In preparing chromium plume maps for the 2015 Annual Report, it became apparent that a distinction needed to be made between plume extent above and below the 4970-ft silt/clay unit. This distinction was made not only in preparing the initial and the 2015 chromium plume maps, but also in revising the initial and preparing the 2015 plume maps for the predominant VOCs. Annual Reports prepared since that time distinguish between plume extent above and below the 4970-ft silt/clay unit.

The extent of the initial TCE plume above the 4970-ft silt/clay unit (hereafter the on-site plume) is shown in Figure 1.6 and that of the plume below the 4970-ft silt/clay and at the off-site areas (hereafter the regional plume) is shown in Figure 1.7. The corresponding initial DCE plumes are shown in Figures 1.8 and 1.9, and the initial TCA plumes are shown in Figures 1.10 and 1.11. Dissolved chromium concentrations, or total chromium concentrations wherever dissolved chromium data were not available, were used in determining the initial extent of the chromium plumes. The extent of the initial on-site chromium plume is shown in Figure 1.12 and that of the regional chromium plume is shown in Figure 1.13.

As indicated by these figures, the largest initial plume was that of TCE. Based on the initial horizontal and vertical extent of the plume for this compound, and a porosity of 0.3, the initial pore volume of the plume was estimated to be approximately 150 million cubic ft (ft³), or 1.13 billion

² The original treatment system consisted only of the air stripper; a chromium removal unit was added in early 2014 to address increased chromium concentrations in the influent. In late 2019 and early 2020 chromium concentrations in the influent decreased below the New Mexico standard, and the chromium removal unit is being bypassed as of March 4, 2020; while the unit remains on a stand-by status, it may be removed if influent chromium concentrations consistently remain below the New Mexico standard.

³ The original design consisted of six infiltration ponds. Based on performance data from these ponds, two ponds were backfilled in late 2005 and another two in early 2014 with the approval of the regulatory agencies.

⁴ Letter dated February 5, 2016 from Chuck Hendrickson of USEPA and Dave Cobrain of NMED to Ernesto Martinez of Sparton, re: Approval with Modifications, Request for Approval of Changes to Reporting Requirements and to Sampling Methodology, Sparton Technology, Inc., Former Coors Road Plant Remedial Program, EPA ID No. NMD083212332.

gallons, or 3,450 acre-ft [see the 1999 Annual Report (S.S. Papadopoulos & Associates, Inc. [SSP&A], 2001a)].

Based on trends in the monthly mass removal rates by the off-site and source containment systems and the mass of VOCs removed as of the end of 2019, the initial dissolved VOC mass within the aquifer underlying the site and its vicinity is currently estimated to be about 8,750 kilograms (kg) or 19,290 pounds (lbs) consisting of about 8,070 kg (17,790 lbs) of TCE, about 655 kg (1,445 lbs) of DCE, and about 25 kg (55 lbs) of TCA.⁵ Available data are not adequate for estimating the initial mass of dissolved chromium.

The off-site containment well began operating on December 31, 1998 and is currently operating at an average pumping rate of about 300 gallons per minute (gpm). The year 2019 constitutes the 21st year of operation of the off-site containment system. The source containment system began operating at an average rate of about 50 gpm on January 3, 2002. Thus, the year 2019 constitutes the 18th year of operation of this system. As discussed in the 2013 Annual Report (SSP&A, 2014), the source containment system was shut down on November 15, 2013 to implement corrective measures for addressing increased chromium concentrations in the pumped water. These corrective measures, which consisted of the addition of a chromium removal unit to the treatment system and of modifications to the plumbing to accommodate this unit, were implemented in early 2014, and the source containment system resumed operations on April 23, 2014.

Between the beginning of the current remedial operations in December 1998 and the end of May 2011, Metric Corporation (Metric) of Albuquerque and then of Los Lunas, New Mexico was responsible for the operation of the remedial systems, the collection of monitoring and system performance data, and for other field activities. After the passing away of Gary Richardson of Metric in May of 2011, SSP&A was responsible for these activities between June 1, 2011 and July 31, 2014, and OCCAM/EC (formerly Easterling Consultants, LLC) of Albuquerque, New Mexico between August 1, 2014 and June 30, 2018. Since July 1, 2018 these activities are conducted by EA Engineering, Science, and Technology, Inc., PBC (EA) of Albuquerque, New Mexico.

The objectives of the containment systems are:

- To contain and capture contaminated groundwater in the off-site area;
- To contain and capture most of the contaminated groundwater leaving the on-site area;
- To treat the captured water and return it to the aquifer; and
- Achieve ground water standards to the extent required by the terms of the Consent Decree (2000).

The purpose of this 2019 Annual Report is to:

- Discuss problems encountered during the 2019 operation of the systems;
- Present the data collected during 2019 from operating and monitoring systems; and

⁵ This estimated initial VOC mass does not include VOCs that were removed from groundwater by SVE systems that were operated at the on-site area.

- Evaluate the performance of the systems with respect to meeting the above cited objectives, and the requirements of the site's permits.

This report was prepared by SSP&A on behalf of Sparton. Issues related to the year-2019 operation of the off-site and source containment systems are discussed in Section 2. Data collected to evaluate system performance and to satisfy permit or other requirements are presented in Section 3, and Section 4 presents evaluations of these data with respect to the performance and the goals of the remedial systems. A summary and conclusions of the report and a discussion of future plans are presented in Section 5. Section 6 lists previous reports and documents pertinent to site investigations and activities, including references cited in this report.

Section 2

System Operations

2.1 Monitoring Well System

During 2019, water levels were measured in and samples were collected from all accessible monitoring wells as required under the terms of the Groundwater Monitoring Program Plan⁶ (Monitoring Plan) and the State of New Mexico Groundwater Discharge Permit DP-1184 (Discharge Permit) at the frequency specified in these documents.

The completion flow zone, location coordinates, and measuring point elevation of all wells that existed during 2019 are presented on Table 2.1; their diameters and screened intervals are summarized on Table 2.2. The wells sampled under the requirements of the Monitoring Plan and the Discharge Permit are listed on Table 2.3; also shown on this table are the sampling frequency of these monitoring wells, the method used for purging and sampling each well and, for wells sampled by a pump, the depth to the intake of the pump. Note that twelve, mostly on-site, 2-inch diameter, and relatively shallow, wells are purged and sampled by bailer; the remaining monitoring wells are purged and sampled by dedicated pumps. Also note that, to minimize the required purge volume for some of the deeper monitoring wells, an inflatable packer has been installed a few feet above the top of the screen; before purging, the packer is inflated to isolate the pump and the screened interval from the water column above the packer, and purge volume is based on the volume of water below the packer. After the end of purging, the sample is collected from the purged isolated interval below the packer.

2.2 Containment Systems

2.2.1 Off-Site Containment System

Water levels in the off-site containment well, CW-1, the two nearby observation wells, OB-1 and OB-2 (see Figure 1.2), and the infiltration gallery piezometer, PZG-1 (see Figure 1.4), were measured quarterly. Samples of the influent to and effluent from the treatment plant were collected monthly for water-quality analyses. The Off-Site Containment System operated about 99.5 percent of the time available during 2019; the total hours of operation and the downtime for the system during the year are summarized on Table 2.4.

2.2.2 Source Containment System

Water levels in the source containment well, CW-2, were measured quarterly, and water-quality samples of the influent to and effluent from the treatment system were collected monthly and before each tank exchange for the chromium removal unit;⁷ a sample of the effluent from the

⁶ Attachment A to the Consent Decree.

⁷ When a scheduled tank exchange happened to occur a few days before or a few days after the beginning of the month, the influent/effluent samples collected before the tank exchange were accepted as being representative of conditions at the beginning of the month and a separate set of monthly influent/effluent samples were not collected for that month.

second tank of the chromium removal unit was also collected before each tank exchange. The Source Containment System operated about 99.4 percent of the time available during 2019; the totals hours of operation and downtime for the system during the year are summarized on Table 2.5.

2.3 Problems and Responses

2.3.1 Monitoring Wells

During 2018, the water level in monitoring well MW-62 could be measured only during the First Quarter of 2018 and samples could not be collected from this well during any of the 2018 quarterly sampling events because sampling equipment which got stuck in the well, and which could not be retrieved after several attempts, prevented the collection of these data. In April 2018, Sparton requested⁸ that this well, which served as one of the wells that defined the southern boundary of the initial regional TCE plume (see Figure 1.7), be plugged and abandoned and replaced by well MW-47R. This request was disapproved by the Agencies;⁹ therefore, Sparton prepared a Work Plan for plugging and abandoning well MW-62 and installing a replacement well, MW-62R, at a location near MW-62 (SSP&A, 2018b). This Work Plan was submitted to the Agencies in August 29, 2018¹⁰ and approved, with modification, on November 9, 2018.¹¹ The plugging and abandonment of MW-62 and the installation of the replacement well MW-62R took place during February 11 through 15 of 2019 under the supervision of EA. A completion report for this work was prepared for Sparton by EA and a copy was submitted to the agencies on March 25, 2019.¹² This Completion Report was disapproved by the agencies on June 13, 2019 due to the absence of some additional information that the agencies wanted to be included in the report.¹³ A

⁸ Letter dated April 24, 2018 to Charles Hendrickson of USEPA and Dave Cobrain of NMED from Alex Spiliotopoulos and Stavros S. Papadopoulos of SSP&A with Subject: Sparton Technology, Inc. – Former Coors Road Plant Remedial Program, Request for Replacement of Well MW-62 with Well MW-47R.

⁹ Letter dated June 13, 2018 from Chuck Hendrickson of USEPA and Dave Cobrain of NMED to Ernesto Martinez of Sparton, Re: Disapproval, Request for Replacement of Well MW-62 with Well MW-47R, Sparton Technology, Inc., EPA ID No. NMD 083212332.

¹⁰ Transmittal letter dated August 29, 2018 to Charles Hendrickson of USEPA and Dave Cobrain, John Kielling, Michelle Hunter, and Brian Salem of NMED from Alex Spiliotopoulos and Stavros S. Papadopoulos of SSP&A with Subject: Sparton Technology, Inc. Former Coors Road Plant Remedial Program, Work Plan for Plugging and Abandoning Monitoring Well MW-62 and for Installing Replacement Well MW62R.

¹¹ Letter dated November 9, 2018 from Chuck Hendrickson of USEPA and Dave Cobrain of NMED to Ernesto Martinez of Sparton, Re: Approval with Modification, Work Plan for Plugging and Abandoning Monitoring Well MW-62 and for Installing Replacement Well MW62R, Sparton Technology, Inc., EPA ID No. NMD 083212332, ST-18-001.

¹² Letter dated March 25, 2019 to Ernesto Martinez of Sparton from Robert Marley of EA, Re: Completion Report for Monitoring Well MW-62 Replacement, Sparton Technologies, Inc., Albuquerque, New Mexico; copy transmitted to Charles Hendrickson of USEPA and Dave Cobrain of NMED by e-mail of the same date from Robert Marley of EA.

¹³ Letter dated June 13, 2019 from Chuck Hendrickson of USEPA and Dave Cobrain of NMED to Ernesto Martinez of Sparton, Re: Disapproval, Completion Report for Monitoring Well MW-62 Replacement, March 2019,

revised Completion Report and a response to agency comments was prepared by EA and submitted to the agencies on August 28, 2019.¹⁴ The revised Completion Report was approved by the agencies on October 3, 2019.¹⁵

2.3.2 Containment Systems

There were only two downtimes at the off-site containment system during 2019 (see Table 2.4). One of these was due to an air stripper fault that occurred in May and lasted for about 16 hours, and the other one was due to a power outage that occurred during a snow storm in late November and lasted for almost 31 hours.

At the source containment system, downtimes of about half an hour or less occurred during each of the eleven tank exchanges for the chromium removal unit, and two downtimes of a few hours each occurred for routine maintenance (see Table 2.5). In addition, there were two downtimes which were also the longest ones; one of these occurred in February due to an air stripper level control fault (about 11 hours), and the other in late November due to the power outage that occurred during the snow storm (about 31 hours).

Sparton Technology, Inc., EPA ID No. NMD 083212332, ST-19-001, sent by Certified Mail and transmitted by e-mail dated June 12, 2019 from Cynthia Martinez of NMED.

¹⁴ Copy of revised Completion Report and a letter dated August 28, 2019 to Charles Hendrickson of USEPA and Dave Cobrain of NMED from Robert Marley of EA, Re: Response to Comments, Completion Report for Monitoring Well MW-62 Replacement, Sparton Technologies, Inc., Albuquerque, New Mexico, transmitted by e-mail of the same date from Robert Marley of EA.

¹⁵ Letter dated October 3, 2019 from Chuck Hendrickson of USEPA and Dave Cobrain of NMED to Paul Warmus of Cerberus and Stuart Boyd of Sparton, Re: Approval, Completion Report for Monitoring Well MW-62 Replacement, Sparton Technology, Inc., EPA ID No. NMD 083212332, ST-19-001, sent by Certified Mail and transmitted by e-mail of the same date from Cynthia Martinez of NMED.

Section 3

Monitoring Results

The following data were collected in 2019 to evaluate the performance of the operating remedial systems and to meet the requirements of the Consent Decree and of the permits for the site:

- Water-level and water-quality data from monitoring wells;
- Data on containment well flow rates; and
- Data on the quality of the influent to and effluent from the water-treatment systems.

3.1 Monitoring Wells

3.1.1 Water Levels

Water levels during 2019 were measured quarterly, in February, May, August and November. During each round of measurements, the depth to water was measured in all accessible monitoring wells, the off-site and source containment wells, the two observation wells near the off-site containment well, and the piezometer installed in the infiltration gallery. The corresponding elevations of the water levels during each of the four measurement rounds, calculated from these data, are summarized on Table 3.1. Selected monitoring well hydrographs are presented in Figure 3.1. As these hydrographs indicate, until several years ago, regional water-levels had been declining due to groundwater production from deeper aquifers and a reduction in the extent of irrigated lands in the vicinity of the Site. The declining trend was reversed in 2013 and since then water levels have a generally rising trend. This reversal in water-level trends was attributed to a reduction in groundwater pumping through surface water use from the San Juan-Chama Drinking Water Project (Powell and McKean, 2014), and to increases in recharge due to recent improvements at the Arroyo de las Calabacillas.

Water levels in some on-site wells completed above the 4970-foot silt/clay unit are also affected by the operation of the source containment system; they particularly respond to the discharge, or lack of discharge, of treated water into the infiltration ponds, depending on their proximity to the pond that is active at a given time. (See, for example, the hydrographs of wells MW-17 and MW-22 in Figure 3.1.)

Note also that, as it has been often the case in the past, the water level in well MW-9 was below the bottom of the screen during the First, Second, and Fourth Quarter water-level measurements during 2019 (see Table 3.1). In their approval of the 2017 Annual Report (SSP&A, 2018a) the agencies raised the question of whether the occurrence of this condition affects the validity of data collected from this well.¹⁶ Well MW-9 has a 5-foot blank casing below the bottom

¹⁶ Letter dated September 13, 2018 from Chuck Hendrickson of USEPA and Dave Cobrain of NMED to Ernesto Martinez of Sparton, re: Approval with Modification, 2017 Annual Report, Sparton Technology, Inc., EPA ID No. NMD083212332, ST-18-002.

of the screen, and available data indicate that the well is connected to the aquifer through the bottom of this blank casing. Thus, even when the water level is below the bottom of the screen, both water-level and water-quality data obtained from the well are representative of conditions within the aquifer at this location. Evidence to this effect was presented in Sparton's response to the agencies' question.¹⁷

3.1.2 Water Quality

As per the requirements of the Consent Decree, during 2019 samples from wells in the Monitoring Plan were collected at the frequency specified in the Monitoring Plan and analyzed for VOCs and for total chromium; the Fourth Quarter (November) samples from these wells were also analyzed for dissolved chromium. The results of these analyses are presented in Table 3.2.

Under the requirements of the Discharge Permit, samples were also collected quarterly during 2019 from the infiltration gallery and pond monitoring wells and analyzed for VOCs and dissolved chromium, iron, and manganese. Because chromium has been a problem at the onsite area in recent years, pond monitoring wells MW-17¹⁸ and MW-78 were also analyzed for total chromium.¹⁹ The results of the analysis of the samples collected from the infiltration gallery and pond monitoring wells during all sampling events conducted in 2019 are presented in Table 3.3.

Concentrations of TCE, DCE, TCA and of chromium that exceed or are equal to the more stringent of their Maximum Contaminant Levels (MCLs) for drinking water or their maximum allowable concentrations in groundwater set by New Mexico Water Quality Control Commission (NMWQCC) are highlighted on Tables 3.2 and 3.3.

On March 20, 2019, Sparton was notified by NMED²⁰ that the New Mexico Ground and Surface Water Protection Regulations (20.6.2 NMAC) were amended on December 21, 2018 and that under these amended regulations the list of toxic pollutants now includes 1,4-dioxane (dioxane) at a tap water screening level of 4.59 micrograms per liter (µg/L). NMED requested Sparton to revise the application to renew the Discharge Permit to authorize the discharge of dioxane, and provide for the sampling of this compound.²¹ The March 20, 2019 correspondence

¹⁷ Letter dated November 9, 2018 to Charles Hendrickson of USEPA and Dave Cobrain of NMED from Stavros S. Papadopoulos and Alex Spiliotopoulos of SSP&A, with Subject: Approval with Modification of the 2017 Annual Report, Sparton Technology, Inc. - Former Coors Road Plant Remedial Program, EPA ID No. NMD083212332, ST-18-002.

¹⁸ Well MW-17 is also a Monitoring Plan monitoring well and analysis of samples from this well for total chromium is required under the Monitoring Plan.

¹⁹ Besides all the quarterly samples from MW-17 and MW-78, the Third and Fourth Quarter samples from the other pond and gallery monitoring wells were also analyzed for total chromium.

²⁰ Letter dated March 20, 2019 from Michelle Hunter of NMED to Ernesto Martinez of Sparton, Re: Discharge Permit Modification Required for Additional Contaminant, and Abatement Plan Required for Vadose Zone Contamination, Sparton Technology Site, Albuquerque, NM.

²¹ The notification from NMED also raised questions concerning vadose zone contamination and potential vapor intrusion associated with the Sparton site; a proposal made by SSP&A on behalf of Sparton for investigating this issue is pending agency response.

was followed by a letter dated April 8, 2019 from USEPA and NMED requesting under the Consent Decree that monitor wells be sampled for dioxane²² Sparton disagreed with these requests and as to the request under the Consent Decree that monitor wells be sampled for dioxane filed a Notice of Dispute on April 30, 2019.²³ After several discussions between representatives of NMED, USEPA, and Sparton, including a June 26, 2019 meeting in Albuquerque, New Mexico, the parties agreed that samples for dioxane be collected from all monitoring wells, including MW-54 and MW-63 which are normally monitored only for water levels, and from the influent and effluent of both containment systems during two consecutive quarterly sampling events, and that any further discussion concerning the sampling for dioxane or its inclusion in the application to renew the discharge permit be postponed until the completion and evaluation of the results of these sampling events.

The first round of these two quarterly dioxane sampling events was conducted in November 2019 during the Fourth Quarter sampling. The results of this dioxane sampling event were submitted to the agencies²⁴ and are reproduced on Table 3.4 of this report.

3.2 Containment Systems

3.2.1 Flow Rates

The volumes of groundwater pumped by the off-site and source containment wells during 2019 and the corresponding flow rates are summarized on Table 3.5.

Since the installation of the chromium removal unit at the source containment system in early 2014, the influent flow rate and the flow rate of the water diverted to the chromium removal unit are monitored at frequent intervals. These flow rate data for 2019 are included on the table that presents chromium concentration data associated with the chromium removal unit (Table 3.8).

3.2.2 Influent and Effluent Quality

Concentrations of TCE, DCE, TCA, and of total chromium, and dissolved chromium, iron, and manganese in monthly influent and effluent samples collected from the off-site containment system during 2019 are summarized on Table 3.6; the concentrations of the same constituents in

²² Letter dated April 8, 2019 from Dave Cobrain of NMED and Chuck Hendrickson of USEPA to Ernesto Martinez of Sparton Re: Notification of Regulation Change and Requirement to Add 1,4-Dioxane to the Monitoring Plan, Sparton Technology Site, Albuquerque, NM.

²³Letter dated April 30, 2019 to Dave Cobrain of NMED and Chuck Hendrickson of USEPA, from James B. Harris of TKLaw, Re: Notice of Dispute, with cc to Chief, Environmental Enforcement Section, Environment and Natural Resources Division, USDOJ, Director, Compliance Assurance and Enforcement Division, USEPA, Region 6, Regional Counsel, Office of the Regional Counsel, USEPA, Region 6, Albuquerque City Attorney, Legal Department, County Attorney, Chief, Hazardous and Radioactive Materials Bureau, NMED, Director, Environmental Enforcement Division, New Mexico Attorney General's Office.

²⁴ Letter dated January 30, 2020 to Charles Hendrickson of USEPA and to Dave Cobrain, Kevin Pierard, Michelle Hunter, Naomi Davidson, Melanie Sandoval, and Justin Ball of NMED from Stavros S. Papadopoulos and Alex Spiliotopoulos of SSP&A with Subject: Sparton Technology, Inc. – Former Coors Road Remedial Program, Results of Fourth Quarter 2019 1,4-Dioxane Sampling Event.

monthly influent and effluent samples collected from the source containment system during 2019 are summarized on Table 3.7.²⁵ Concentrations of TCE, DCE, TCA, and of chromium that exceed or are equal to the more stringent of their MCLs for drinking water or their maximum allowable concentrations in groundwater set by NMWQCC are highlighted on Tables 3.6 and 3.7.

Since the installation of the chromium removal unit at the source containment system, besides the monthly influent and effluent samples that are analyzed for the specified VOCs and metals, samples are also collected for chromium analysis from points along the chromium treatment unit. During 2019, these samples were collected before each tank exchange from the influent to the treatment system, the effluent from the second tank, and the effluent from the air stripper that discharges into the ponds. The chromium concentrations in these samples are summarized on Table 3.8. To provide a complete picture of the 2019 chromium concentrations at the source containment system, chromium concentrations in the monthly influent and effluent samples, which were already presented on Table 3.7, are also included on Table 3.8; chromium concentrations that exceed or are equal to the NMWQCC standard of 50 µg/L are highlighted.

During the first three months of 2019 the influent to the treatment plant ranged between 61 gpm and 63 gpm with about 27 gpm diverted through the chromium removal unit, and tank exchange occurred once every four weeks. By about mid-April, as chromium concentrations in the influent had declined to only slightly above the NMWQCC standard, the amount of water diverted to the chromium removal unit was reduced to about 20 gpm and the tank exchange frequency was changed to once every five weeks. Another change to the tank exchange frequency, to once every six weeks, was made near the end of October when influent chromium concentrations declined to 50 µg/L.

²⁵ The data from the January 2020 samples are also included on these tables because they are used to calculate the average contaminant concentrations in the influent during December 2019; these average concentrations are then used to calculate mass removal rates for the month of December.

Section 4

Evaluation of Operations

As stated in the Introduction (Section 1), the objectives of the off-site and source containment systems are:

- To contain and capture contaminated groundwater in the off-site area;
- To contain and capture most of the contaminated groundwater leaving the on-site area;
- To treat the captured water and return it to the aquifer; and
- Achieve ground water standards to the extent required by the terms of the Consent Decree (2000).

This section presents evaluations of the performance of the off-site and source containment systems, based on data collected during 2019, with respect to their meeting the above-stated objectives.

4.1 Hydraulic Containment

4.1.1 Water Levels and Capture Zones

The water-level elevation data presented in Table 3.1 were used to evaluate the performance of both the off-site and source containment wells with respect to providing hydraulic containment for the regional plumes and potential on-site source areas. Maps of the elevation of the on-site water table and of the water levels in the UFZ/ULFZ and the LLFZ during each quarterly round of water-level measurements in 2019 are shown in Figures 4.1 through 4.12. The quarterly on-site water tables are shown in Figures 4.1, 4.4, 4.7, and 4.10; also shown on these figures are the capture zone of the source containment well in UFZ/ULFZ and the extent of the on-site TCE plume. The quarterly water levels and the capture zones of the off-site and source containment wells within the UFZ/ULFZ are shown in Figures 4.2, 4.5, 4.8, and 4.11, and those within the LLFZ are shown in Figures 4.3, 4.6, 4.9, and 4.12; also shown on these figures is the extent of the regional TCE plume. The extent of the TCE plume shown in Figures 4.1 through 4.9 is based on last year's (November 2018) water-quality data from monitoring wells, and that of the plume shown on the water-level maps for November 2019 (Figures 4.10 through 4.12) is based on the November 2019 water-quality data.

The on-site TCE plume lies along the southern limit of the 4970-ft silt/clay unit; the configuration of the on-site water table (Figures 4.1, 4.4, 4.7, and 4.10) indicates that groundwater from the plume area discharges into the regional aquifer over the edge of the 4970-ft silt/clay unit, mostly within the capture zone of the source containment well in the UFZ/ULFZ; vertical leakage of contaminated water across the silt/clay unit is also mostly within the capture zone of the source containment well. The water levels in the UFZ/ULFZ (Figures 4.2, 4.5, 4.8, and 4.11) and in the LLFZ (Figures 4.3, 4.6, 4.9, and 4.12) show that at a pumping rate that averaged 301 gpm during 2019, the capture zone of the off-site containment well CW-1 extends beyond the November 2018 or November 2019 extent of the regional TCE plume and provides an ample safety margin to the hydraulic containment of this plume. These water levels also indicate that at an average

pumping rate of 57 gpm for the year, the source containment well CW-2 continued to capture contaminated groundwater leaving the on-site area.

Water-level measurements in the three DFZ wells, MW-67, MW-71R, and MW-79, for each quarterly round of 2019 are shown in Figure 4.13. Also shown in this figure are the average water level in these wells, calculated from the quarterly measurements, and the direction of groundwater flow and the hydraulic gradient during each quarterly measurement event and under average conditions. During 2019 the direction of groundwater flow in the DFZ ranged from W 3.5° N in November to W 21.3° N in August, and the hydraulic gradient from 0.00234 in November to 0.00469 in August. The average direction of groundwater flow in the DFZ during 2019 was W 16.4° N with an average hydraulic gradient of 0.00346.

4.1.2 Effects of Containment Well Shutdown on Capture

The containment systems are occasionally shut down for maintenance and repairs, and sometimes due to power or equipment failures (see Tables 2.4 and 2.5). The potential effects of such shutdowns on contaminant migration are discussed below.

The capture zone of the source containment well lies within the capture zone of the off-site containment well, and its downgradient limit is within the plume area. Any shutdown of this well would cause some contaminants to escape beyond its capture zone, but these contaminants will remain within the capture zone of the off-site containment well and eventually be captured by this well.

Given the distance between the leading edge of the off-site plume and the limits of the capture zone of the off-site containment well, it is highly unlikely that any contaminants would escape beyond the capture zone of this well during a shutdown of limited duration. Under non-pumping conditions, the hydraulic gradient near the leading edge of the plume is about 0.003. The aquifer above the 4800-ft clay has a hydraulic conductivity of 25 feet per day (ft/d) and a porosity of about 0.3. Thus, the rate at which groundwater, and hence contaminants, would move under non-pumping conditions is 0.25 ft/d or about 90 feet per year (ft/yr). The downgradient distance between the limit of the capture zone of the off-site containment well and the leading edge of the plume is at least 150 ft (see for example Figures 4.2 and 4.3 or 4.11 and 4.12). Thus, shutdowns of the length that have been experienced in the past, and of even much longer periods, could not cause any contaminants to escape beyond the capture zone of the well. Hydraulic containment of the plume has been, therefore, maintained during any past shutdowns of the off-site containment system, and will continue to be maintained during any future shutdowns of reasonable duration.

4.2 Groundwater Quality in Monitoring Wells

4.2.1 Concentration Trends

Plots showing temporal changes in the concentrations of TCE, DCE, TCA, and dissolved chromium, or total chromium when data on dissolved chromium were not available, were prepared for a number of on-site and off-site monitoring wells to demonstrate long-term water-quality changes at the Sparton site. Plots for on-site wells completed above the 4970-ft silt/clay unit are shown in Figure 4.14; plots for on-site wells completed below the silt/clay unit and for off-site wells are shown in Figure 4.15.

In general, VOC concentrations in both on-site and off-site wells have a decreasing trend. Significant decreases in VOC concentrations occurred in most on-site wells completed above the 4970-ft silt/clay unit between 1998 and the mid-2000s (see plots for wells MW-16, MW-23, MW-25, and MW-26 in Figure 4.14). This is primarily due to the operation of soil vapor extraction (SVE) systems at the site during short periods in 1998 and 1999, and again for about a year between April 2000 and June 2001, and to the flushing effects of the water infiltrating from the infiltration ponds of the source containment system since the start of the system operation in 2002. Wells along the southern limit of the 4970-ft silt/clay unit (see plots for wells MW-07 and MW-12 in Figure 4.14), however, have also a declining trend but do not appear to have been significantly affected by the SVE operations or the infiltration ponds; this is attributed to the presence of a low permeability zone that somewhat isolates the sands above the southern limit of the 4970-ft silt/clay unit from those to the north of this zone.

The VOC concentration trends in on-site wells completed below the 4970-ft silt/clay unit are illustrated by the plots for wells MW-19, MW-42, and MW-72 shown in Figure 4.15. Prior to the start of the source containment system, well MW-19 had a declining trend, and in fact VOC concentrations in this well had declined below the regulatory standards by 2000; however, after the start of the source containment system in 2002, VOC concentrations in the well sharply increased until 2004, primarily due to increased vertical leakage, and then resumed a declining trend. Most other on-site wells completed below the 4970-ft silt/clay unit, except MW-72, have a declining trend similar to that of MW-42, or are free of any VOCs. Well MW-72 had high concentrations of VOCs when it was installed in early 1995 but, after a few years, concentrations began declining; this declining trend continued until 2008 when VOC concentration started increasing again. During the last several years, TCE and DCE concentrations in the well declined from 980 and 150 $\mu\text{g/L}$, respectively, in November 2015 to 9.9 and <1 $\mu\text{g/L}$ in November 2018; the November 2019 TCE and DCE concentrations in the well were 17 and 1.4 $\mu\text{g/L}$, respectively (see Table 3.2).

The VOC concentration in most off-site wells have been also declining (see plots for wells MW-37/37R, MW-55, and MW-60 in Figure 4.15). As it has been the case for all but one (2018) of the past years, during 2019 well MW-60 was again the off-site monitoring well with the highest TCE concentration; the November 2019 TCE concentration in the well was 120 $\mu\text{g/L}$ (see Table 3.2).

Chromium concentrations in most monitoring wells completed above the 4970-ft silt/clay unit have been high, mostly above the NMWQCC standard of 50 $\mu\text{g/L}$, and remained high (see for example wells MW-16, MW-23, MW-25, and MW-26 in Figure 4.14); an increase occurred soon after the start of the source containment system due to the rise of the water levels in the sands above the 4970-ft silt/clay unit and the resulting mobilization of chromium that was present in the previously unsaturated zone above the former water table. A second, similar increase occurred during the early to mid-2010s due to rising regional water levels (see Figure 3.1).

Chromium concentrations in on-site monitoring wells completed below the 4970-ft silt/clay (see plots for wells MW-19, MW-42, and MW-72 in Figure 4.15) also began rising after the start of the source containment system; this is attributed to increases in the leakage through the 4,970-ft silt/clay unit that resulted from steeper downward gradients; these steeper gradients were caused by the rise in water levels above the 4970-ft silt/clay unit due to infiltration from the ponds

and the decline of water levels below this unit due to pumping from well CW-2. After this initial rise, chromium concentration trends in these wells varied from time to time. Wells in the off-site area (see plots for wells MW-37/37R, MW-55, and MW-60 in Figure 4.15) also display varying trends in chromium concentrations.

Of the three monitoring wells completed in the DFZ, wells MW-67 and MW-79 have been clean since their installation in 1996 and 2006, respectively. The third DFZ well, MW-71R, located about 70 ft south of MW-60, was installed in February 2002 as a replacement for DFZ well MW-71 which was plugged and abandoned in October 2001 because of contamination.²⁶ The first sample from MW-71R, obtained in February 2002, had a TCE concentration of 130 µg/L; the TCE concentration in the well increased to 210 µg/L by August 2003 and then began declining with occasional minor fluctuations. Concentrations of TCE in the well during quarterly sampling events in 2019 ranged from 15 µg/L in February to 9.6 µg/L in November (see Table 3.2).

4.2.2 Concentration Distribution and Plume Extent

In past Annual Reports, the extent of groundwater contamination near the end of the year was illustrated by presenting isoconcentration (plume) maps for TCE and DCE based on the Fourth Quarter water-quality data for that year.²⁷ As stated in Section 1, because of the increased chromium concentrations that led to the installation of the chromium removal unit at the source containment system, the USEPA and NMED requested Sparton also to include plume maps for chromium in the 2015 and subsequent Annual Reports (see Footnote 4 on page 1-2). To prepare the 2019 plume maps for TCE, DCE, and chromium, the Fourth Quarter 2019 data presented in Tables 3.2 and 3.3 and the concentrations of these compounds in the CW-1 and CW-2 influent samples from the November monthly sampling event (see Tables 3.6 and 3.7) were used. Also, as mentioned in Section 1, a distinction was made between the extent of these compounds above the 4970-ft silt/clay unit (on-site plumes) and that below this unit and in the off-site areas (regional plumes).

The horizontal extent of the on-site TCE plume is shown in Figure 4.16 and that of the regional TCE plume is shown in Figure 4.17.²⁸ The concentration of DCE in wells completed above the 4970-ft silt/clay unit is shown in Figure 4.18; note that an on-site DCE plume does not currently exist and that DCE concentrations at all wells were below the detection limit of 1 µg/L. The extent of the regional DCE plume is shown in Figure 4.19. Since 2018, TCA has not been detected above the detection limit of 1 µg/L in any monitoring or containment well.

²⁶ See 1999 Annual Report (SSP&A, 2001a) for a detailed discussion of the history of well MW-71, and SSP&A and Metric (2002) for actions taken prior to its plugging and abandonment.

²⁷ Until and including the 2008 Annual Report an isoconcentration map for TCA was also included in the Annual Reports. Because TCA concentrations since 2003 have been below regulatory standards, this practice was discontinued, with the approval of the agencies, starting with the 2009 Annual Report.

²⁸ At well cluster locations, the concentration shown in Figures 4.17, 4.19 and 4.21 is that for the well with the highest concentration. In cases where the concentrations in all wells of the cluster are the same, the well identified in these figures is the deepest well in the cluster.

The extent of the on-site chromium plume is shown in Figure 4.20 and that of the regional chromium plume is shown in Figure 4.21. These chromium plume maps were prepared using measured dissolved chromium concentrations.

4.2.2.1 Changes in Concentrations

A total of 57 monitoring wells and the influent from the two containment wells were sampled in November 2019 to provide data for the preparation of the TCE, DCE and chromium plume maps that are presented in Figures 4.16 through 4.21. Of these 57 wells, 40 are wells that existed in November 1998 (prior to the implementation of the current remedial activities), 8 are replacement or deepened versions of wells that existed in November 1998, and the remaining 9 are wells that were installed in later years. Changes between the TCE, DCE, and chromium concentrations measured in these wells in November 2019 and those measured in November 1998, or during the first sampling event after their installation, are summarized on Table 4.1.²⁹ Note that Table 4.1 also identifies wells which have been used in the preparation of both the initial (Figures 1.6 through 1.9, 1.12 and 1.13) and the 2019 (Figures 4.16 through 4.21) extent of the TCE, DCE, and chromium plumes. The distribution of TCE, DCE, and chromium concentration changes that occurred since the implementation of the off-site and source containment systems in wells completed above the 4970-ft silt/clay unit are presented in Figures 4.22, 4.24, and 4.26, and those in wells completed below the silt/clay unit or in the off-site area are presented in Figures 4.23, 4.25, and 4.27.

As this table and figures indicate, current TCE and DCE concentrations in most, if not all, wells are much lower than those that existed prior to the start of the current remedial operations. There are only four wells where the concentrations of both TCE and DCE (MW-19 and MW-52R) or of either TCE (MW-62R) or of DCE (CW-1) were higher in 2019 than they were in 1998. These increases in concentration range from less than 1 µg/L to 15 µg/L, and except for CW-1, are in wells with relatively low 2019 concentrations.

The changes in chromium concentrations, however, indicate increases in a large number of wells, particularly in on-site wells completed both above and below the 4970-ft silt/clay unit. As discussed earlier (see Section 4.2.1), these increases in chromium concentrations are attributed to the mobilization of chromium that was present in the previously unsaturated zone above the former water table, and to increases in the leakage across the 4,970-ft silt/clay unit that resulted from steeper downward gradients. It should be noted that, for monitoring wells with only total chromium concentrations available in 1998, the concentration changes reported on Table 4.1 and shown in Figures 4.26 and 4.27 are based on a comparison between initial total chromium concentrations and dissolved chromium concentrations measured in November 2019.

²⁹ Another two monitoring wells that existed in November 1998, MW-54 and MW-63, were also sampled in November 2019 primarily for dioxane. These wells could not be used in calculating changes in TCE, DCE, and chromium concentrations that occurred since the implementation of the current remedial systems because the 2019 sample from MW-63 was analyzed only for dioxane and, although the 2019 sample from MW-54 was also analyzed for these constituents, this well was not sampled for water-quality analyses in 1998 or later years.

4.3 Containment Systems

4.3.1 Flow Rates

The volume of water pumped from the off-site containment well during 2019 was approximately 158 million gallons and that pumped from the source containment well was a little over 30 million gallons (see Table 4.2). The corresponding average annual pumping rates were 301 gpm and 57 gpm, respectively, and the average pumping rates during operating hours were about 302 gpm and 57.5 gpm, respectively. A plot of the volume of water pumped by each well during each month of 2019 and of the total monthly volume is presented in Figure 4.28. The total volume of water pumped by both wells during 2019 was about 188 million gallons and corresponds to an average pumping rate of about 358 gpm for the year.

The volume of water pumped during each year of the operation of the containment wells is summarized on Table 4.2, and a plot of the cumulative volume pumped by the wells since the beginning of their operation is presented in Figure 4.29. As shown on Table 4.2, the total volume of water pumped by the off-site containment well since the beginning of its operation in December 1998 is about 2.785 billion gallons, and that pumped by the source containment well since the beginning of its operation in January 2002 is about 0.436 billion gallons; these volumes of pumped water correspond to 246 percent and 39 percent, respectively, of the initial plume pore volume. The total volume pumped from both wells since the beginning of remedial pumping is about 3.220 billion gallons and corresponds to an average rate of 292 gpm over the 21 years of operation. This volume represents approximately 285 percent of the plume pore volume³⁰.

4.3.2 Influent and Effluent Quality

The concentrations of TCE, DCE, TCA, and of total chromium, iron, and manganese in the monthly samples of influent to and effluent from the off-site treatment system during 2019 were presented on Table 3.6; the corresponding concentrations in the monthly samples of influent to and effluent from the source treatment system were presented on Table 3.7. Plots of the TCE, DCE, and total chromium concentrations in the influent to both systems, prepared from these data, are presented in Figure 4.30.³¹

Concentrations of TCE and DCE in all monthly influent samples from the off-site containment system continued to be considerably above the regulatory standards; TCA concentrations, however, were below the detection limit of 1 µg/L as they have been since 2015. Chromium in the off-site system influent, was reported to be below its detection limit of 6 µg/L except for a few months when it was slightly above the detection limit. Concentrations of VOCs in the effluent samples were below detection limits, and chromium concentrations were at about the same levels as those in the influent.

³⁰ The plume pore volume was calculated from the horizontal and vertical extent of the initial TCE plume (see Appendix B of 1999 Annual Report). Note however, that most of the water pumped by the offsite containment well comes from areas outside of the extent of the initial plume.

³¹ In this figure, contaminants reported as being below their detection limit are plotted as having a concentration equal to the detection limit.

Concentrations of TCE in the influent of the source containment system were above the regulatory standard of 5 µg/L but the highest concentration detected during the year was 8.2 µg/L; both DCE and TCA were below the detection limit of 1 µg/L. Chromium concentrations continued the declining trend that they had during 2018, and the dissolved chromium concentrations were below the NMWQCC standard of 50 µg/L during several months of the year; particularly near the end of the year. Concentrations of VOCs in the effluent samples were below detection limits, and the chromium removal unit at the treatment plant was effective in keeping chromium concentrations in the effluent below the NMWQCC standard.

4.3.3 Contaminant Mass Removal

The monthly and total mass of VOCs removed by the off-site and source containment Systems (TCE and DCE) during 2019, calculated from the monthly flow volumes reported on Table 3.5 and the influent concentrations reported on Table 3.6 and 3.7, are summarized on Table 4.3; also shown on this table is the total mass of VOCs removed by both systems.

A total of 101.3 kg (223.4 lbs) of VOCs, consisting of 90.47 kg (199.5 lbs) of TCE and 10.85 kg (23.92 lbs) of DCE were removed by the two containment wells during 2019. A plot of the TCE, DCE and total VOC mass removed by the two containment wells during each month of 2019 is presented in Figure 4.31. The total mass of VOCs removed by the two containment wells during each year of their operation is summarized on Table 4.4, and a plot of the cumulative TCE, DCE, and total VOC mass removed by the wells is presented in Figure 4.32. As shown on Table 4.4, the total VOC mass removed by the containment wells, since the beginning of the current remedial operations in December 1998, is about 8,140 kg (18,000 lbs), consisting of about 7,550 kg (16,600 lbs) of TCE, 574 kg (1,270 lbs) of DCE, and 20.4 kg (44.9 lbs) of TCA. This represents about 93 percent of the total dissolved VOC mass currently estimated to have been present in the aquifer prior to the testing and operation of the off-site containment system.

The monthly and total mass of chromium removed by the chromium removal unit at the source containment system, based on the monthly flow volumes (see Table 3.5) and the average monthly chromium concentrations in the influent to and effluent from the treatment system (calculated from the monthly sampling data presented on Table 3.7), are summarized on Table 4.5. As shown on this table, a total of about 1.64 kg (3.62 lbs) of chromium was removed during 2019. The total chromium removed by this unit, and by a removal unit that operated at the off-site containment system between December 15, 2000 and October 31, 2001, is about 27.7 kg (61.0 lbs), as summarized on Table 4.6.

4.4 Site Permits

The infiltration gallery associated with the off-site containment system and the rapid infiltration ponds associated with the source containment system are operated under a State of New Mexico Groundwater Discharge Permit (DP-1184). This Discharge Permit was originally issued by the Groundwater Bureau of the NMED for a five-year period on June 23, 1998 and renewed for two more five-year periods on December 29, 2006 and on October 18, 2012. On May 4, 2017, Sparton timely submitted an application to NMED for another five-year renewal of

the Discharge Permit.³² As also referred to in Section 3.1.2 of this report, on March 20, 2019 NMED requested that Sparton²⁰ (1) revise the application to renew the Discharge Permit to authorize the discharge of dioxane, and provide for the sampling of this and (2) develop an Abatement Plan to investigate and, if necessary, remediate vadose zone impacted by chlorinated solvents.

Sparton disagreed with these requests in a letter dated April 30, 2019, to Michelle Hunter²³. In the discussions that followed the parties agreed that samples for dioxane be collected from all monitoring wells and from the influent and effluent of both containment systems during two consecutive quarterly sampling events, and that any further discussion concerning dioxane be postponed until the completion and evaluation of the results of these sampling events. Sparton also submitted a response to the request for vadose zone investigation and remediation on August 23, 2019³³ and a revised response on March 6, 2020.³⁴ As authorized by regulation, Sparton is continuing to discharge the treated water into the infiltration gallery and ponds under the terms of the October 18, 2012 permit.

The air stripper associated with the off-site containment system is operated under Air Quality Source Registration No. NM/001/00462/967, issued by the Air Quality Services Section, Air Pollution Control Division, Environmental Health Department, City of Albuquerque, and the source containment system air stripper is operated under Albuquerque/Bernalillo County Authority-to-Construct Permit No. 1203.

The performance of the off-site and source containment systems with respect to the requirements of these permits is discussed below.

4.4.1 Off-Site Contaminant Systems

Discharge Permit DP-1184 requires quarterly sampling of the infiltration gallery monitoring wells MW-74, MW-75 and MW-76, and monthly sampling of the treatment system effluent. The results of these sampling events during 2019 (see Tables 3.3, and 3.6) were reported

³² On behalf of Sparton, the completed application for the renewal of Discharge Permit DP-1184 and the application fee of \$100 was transmitted on May 4, 2017 to Program Manager, Ground Water Pollution Prevention Section, New Mexico Environment Department, P.O. Box 5469, Santa Fe, NM 87502 by Stavros S. Papadopoulos and Alex Spiliotopoulos of SSP&A.

³³ Letter dated August 23, 2019 to Charles Hendrickson of USEPA and to Dave Cobrain, John Kieling, Michelle Hunter, Naomi Davidson, and Pamela Homer of NMED from Stavros S. Papadopoulos and Alex Spiliotopoulos of SSP&A with Subject: Sparton Technology, Inc. – Former Coors Road Remedial Program, Response to NMED’s Discharge Permit DP-1184 Modification Request for an Abatement Plan for Vadose Zone Contamination.

³⁴ Letter dated March 6, 2020 to Charles Hendrickson of USEPA and to Dave Cobrain, Kevin Pierard, Michelle Hunter, Naomi Davidson, and Melanie Sandoval of NMED from Stavros S. Papadopoulos and Alex Spiliotopoulos of SSP&A with Subject: Sparton Technology, Inc. – Former Coors Road Remedial Program, Revised Response to NMED’s Discharge Permit DP-1184 Modification Request for an Abatement Plan for Vadose Zone Contamination.

to the NMED Groundwater Bureau in the 2019 Annual Monitoring Report for the permit submitted to the Bureau on January 30, 2020.³⁵

Calculations of VOC emissions made in June 1999 indicated that the off-site air stripper was in full compliance with the limits (0.32 pound per hour [lb/hr] or 1.37 tons/yr) specified in Registration No. NM/001/00462/967. Under the terms of the registration, further monitoring and/or reporting of the emissions from the air stripper was not required and has not been carried out since that time.

No violation notices were received during 2019 for activities associated with the operation of the off-site containment system.

4.4.2 Source Containment Systems

The rapid infiltration ponds associated with the source containment system are also subject to the above-stated requirements of Discharge Permit DP-1184. The monitoring wells for this system are MW-17, MW-77 and MW-78; the quarterly data collected from these wells (see Table 3.3) and from the monthly and other sampling of the treatment system effluent (see Tables 3.7 and 3.8) were included in the 2019 Annual Monitoring Report for the permit.³⁵

Emissions of VOCs from the source containment system air stripper during 2019 (0.00022 lb/hr or 0.00096 ton/yr) met the requirements of The Authority-to-Construct Permit No. 1203 and were reported to the Albuquerque Environmental Health Department, Air Quality Division in the 2019 Annual Report on Air Emissions which was submitted on March 30, 2020.³⁶

No violation notices were received during 2019 for activities associated with the operation of the source containment system.

4.5 Contacts

Under the terms of the Consent Decree³⁷ Sparton is required to prepare an annual Fact Sheet summarizing the status of remedial activities as of the end of the previous year, and after approval by USEPA/NMED, distribute this Fact Sheet to property owners located above the plume and adjacent to the off-site treatment plant water discharge pipeline. After the approval

³⁵ Letter to Ms. Melanie Sandoval of the Ground Water Quality Bureau, NMED from Stavros S. Papadopoulos and Alex Spiliotopoulos of SSP&A with Subject: Sparton Technology, Inc. – Former Coors Road Plant Remedial Program, 2019 Annual Monitoring Report for Discharge Permit DP-1184.

³⁶ Letter dated March 30, 2020 to Ms. Regan Eyerman, Health Scientist, Air Quality Division, City of Albuquerque Environmental Health Department, from Stavros S. Papadopoulos and Alex Spiliotopoulos of SSP&A on the subject “Sparton Technology Inc., Former Coors Road Plant Remedial Program – Air Quality Authority-to-Construct Permit #1203 – 2019 Annual Report on Air Emissions”.

³⁷ Public Involvement Plan for Corrective Measure Activities. Attachment B to the Consent Decree in *Albuquerque v. Sparton Technology, Inc.*, No. CV 07 0206 (D.N.M.).

of the 2018 Annual Report (SSP&A, 2019) by USEPA/NMED on August 6, 2019³⁸ Sparton prepared a Draft 2019 Fact Sheet and submitted it to the Agencies for approval on October 15, 2019³⁹. The Agencies approved this Fact Sheet on January 6, 2020,⁴⁰ and the 2019 Fact Sheet was distributed to property owners located above the plume and adjacent to the off-site treatment plant water discharge pipeline on January 16, 2020.

³⁸ Letter from Mr. Dave Cobrain of NMED and Mr. Chuck Hendrickson of USEPA to Mr. Paul Warmus of Sparton Re: Approval 2018 Annual Report, Sparton Technology, Inc., EPA ID No. NMD083212332, HWB-ST-19-002.

³⁹ Email from Stavros Papadopoulos of SSP&A to Chuck Hendrickson of USEPA and Dave Cobrain of NMED, on the subject of “Sparton Technology Inc., Former Coors Road Plant Remedial Program – Draft 2019 Fact Sheet – EPA ID No. NMD083212332 – ST-18-002”.

⁴⁰ Letter dated January 6, 2020 from Mr. Dave Cobrain of NMED and Mr. Chuck Hendrickson of USEPA to Mr. Stuart Boyd of Sparton, Re: Approval with Modifications, 2019 Fact Sheet, Sparton Technology, Inc., EPA ID NO. NMD083212332.

Section 5

Conclusions and Future Plans

5.1 Summary and Conclusions

During 2019, considerable progress was made towards achieving the goals of the remedial measures:

- The off-site containment well operated 99.5 percent of the time available in 2019 at an average rate of 301 gpm and maintained hydraulic containment of the off-site plume.
- The concentrations of constituents of concern in the water treated at the off-site containment system met the requirements of the Discharge Permit for the site.
- The source containment well operated 99.4 percent of the time available in 2019 at an average rate of 57 gpm and continued to capture contaminated groundwater leaving the on-site area.
- The concentrations of constituents of concern in the water treated at the source containment system met the requirements of the Discharge Permit for the site.
- The treated water from both systems was returned to the aquifer through the infiltration gallery in the Arroyo de las Calabacillas and the on-site infiltration ponds.
- Groundwater monitoring was conducted as specified in the Monitoring Plan and the Discharge Permit.
- Samples were obtained monthly from the influent and effluent of the treatment plants for the off-site and source containment systems and analyzed for VOCs, and chromium, iron, and manganese as specified in the Discharge Permit.
- Water levels in all accessible wells and/or piezometers were measured quarterly. Samples were collected for water-quality analyses from monitoring wells at the frequency specified in the Monitoring Plan and analyzed for VOCs and chromium.
- Samples were obtained from the infiltration gallery and infiltration pond monitoring wells at the frequency specified in the Discharge Permit. All samples were analyzed for VOCs, and chromium, iron, and manganese.
- Samples collected during the Fourth Quarter of 2019 from all monitoring wells, including MW-54 and MW-63 which are not usually sampled, and from the influent and effluent of the containment systems were also analyzed for dioxane under the terms of an agreement between Sparton and the agencies.
- Changes in contaminant concentrations observed in monitoring wells since the implementation of the current remedial measures indicate that VOC concentrations decreased significantly both at the on-site and off-site area, and that chromium concentrations increased, primarily at the on-site area.
- A total of about 188 million gallons of water were pumped from the wells during 2019. The total volume of water pumped since the beginning of the current remedial operations

on December 1998 is about 3.22 billion gallons and represents 285 percent of the initial volume of contaminated groundwater (pore volume).

- A total of about 101 kg (223 lbs) of VOCs were removed from the aquifer by the two containment wells during 2019. The total VOC mass that was removed since the beginning of the current remedial operations through the end of 2019 is about 8,140 kg (18,000 lbs) and represents about 93 percent of the total dissolved VOC mass estimated to have been initially present in groundwater.
- The source containment system also removed from the aquifer 1.64 kg (3.62 lbs) of chromium during 2019. The total mass of chromium removed by the chromium removal unit installed at this system in 2014 and by an earlier unit at the off-site containment system is about 28 kg (61 lbs).

5.2 Future Plans

The off-site and source containment systems will continue to operate during 2020 at pumping rates that are as close as possible to their current design pumping rates of 300 gpm and 50 gpm, respectively.

Data collection will continue in accordance with the Monitoring Plan and the Discharge Permit, and as necessary for the evaluation of the performance of the remedial systems.

The USEPA and the NMED will continue to be kept informed of any significant milestones or changes in remedial system operations. The goal of the systems will continue to be the return of the contaminated groundwater to beneficial use.

As per the agreement between the agencies and Sparton, a second round of sampling for dioxane will be conducted during the First Quarter of 2020, and a Status Report summarizing the results of the two rounds of dioxane sampling will be submitted to the agencies by April 30, 2020.⁴¹

Any other tasks that might arise during the implementation of the remedial program in 2020 or as a result of continuing discussions and negotiations between Sparton and the agencies will be addressed as appropriate and/or necessary.

After the approval of this Annual Report, a Draft 2020 Fact Sheet will be prepared and submitted to the USEPA and NMED for approval, and distribution to property owners located above the plume and adjacent to the off-site treatment plant water discharge pipeline upon approval.

⁴¹ The second round of sampling was completed on February 16, 2020 and the Status Report was submitted to the agencies on April 28, 2020. In a June 24, 2020 letter from David Cobrain of NMED and Chuck Hendrickson of USEPA to Stuart Boyd of Sparton, the agencies approved the Status Report but again requested that dioxane be added to the Monitoring Plan, by first sampling for dioxane, all but two (MW-54 and MW-63) of the monitoring wells that were sampled during the previous two rounds, for two additional quarterly rounds starting in August 2020; the agencies then offered Sparton the option to propose a modified list of wells, after the results of these two additional rounds have been reported to the agencies, for dioxane sampling during future sampling events. Sparton's response to this letter is in preparation.

Section 6

List of Reports and Documents

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FIGURES



Figure 1.1: Location of the Former Sparton Coors Road Plant

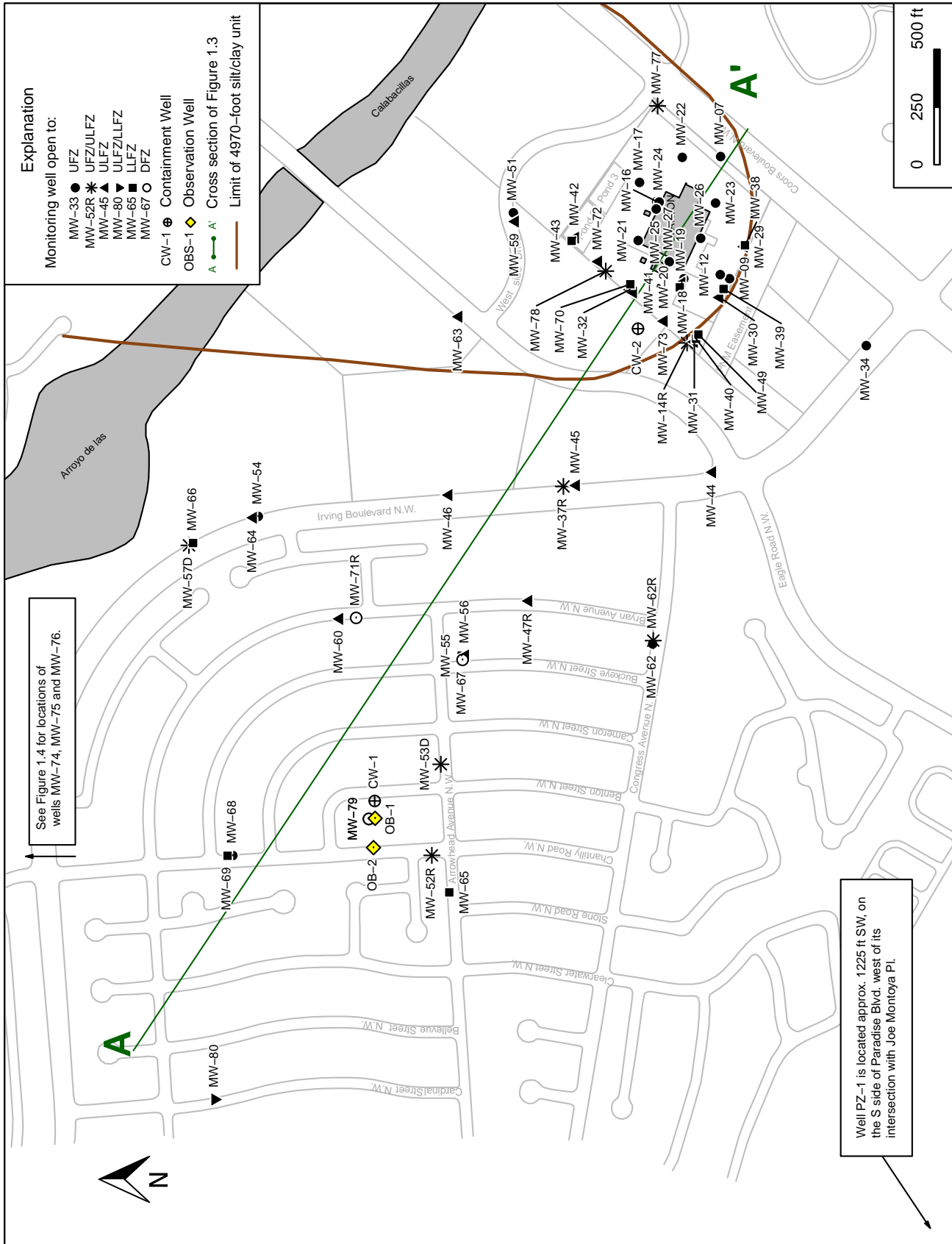


Figure 1.2: Location of Existing Wells

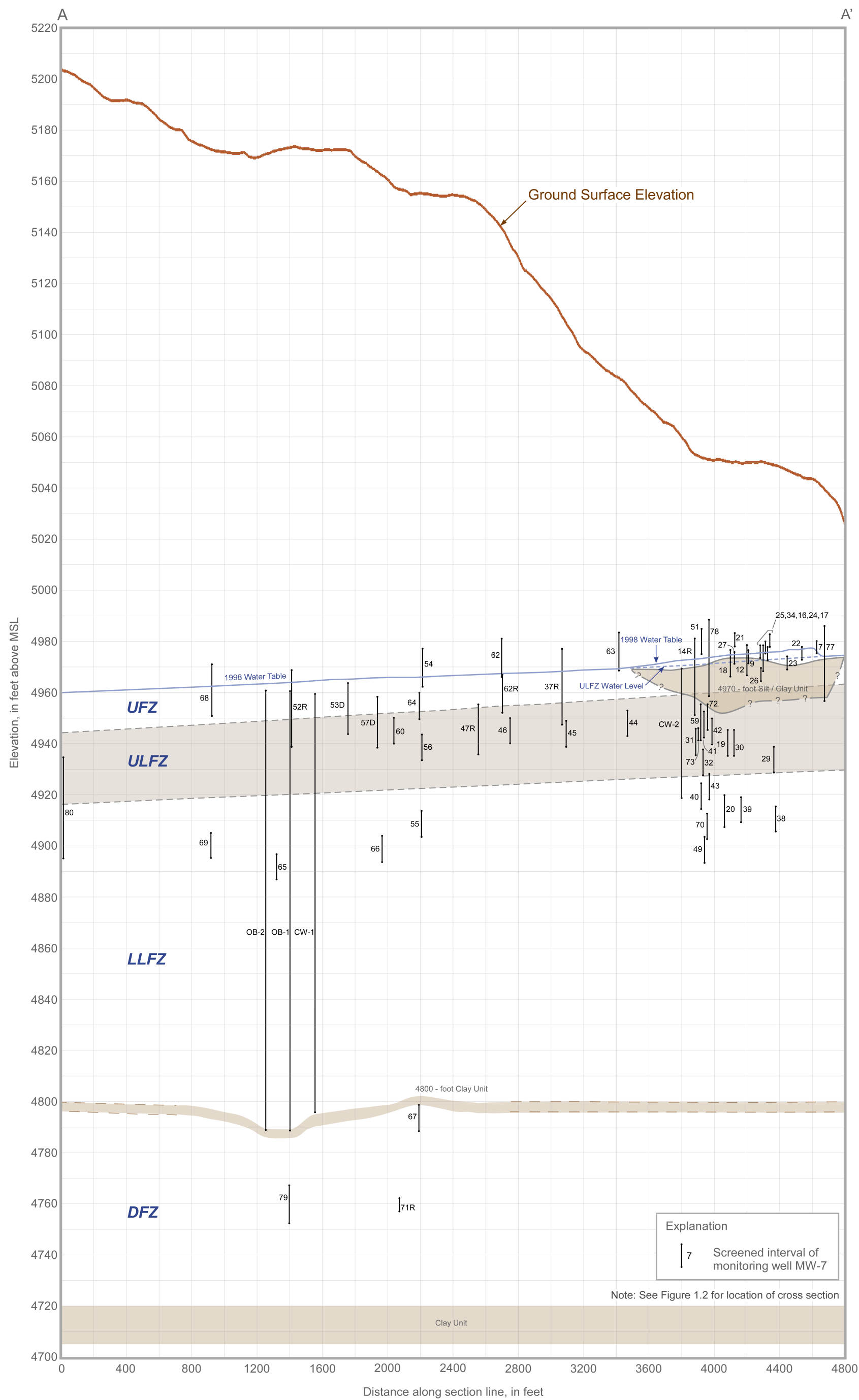


Figure 3.1: Schematic Cross-Section Showing Screened Interval of Wells and Relation to Flow Zones

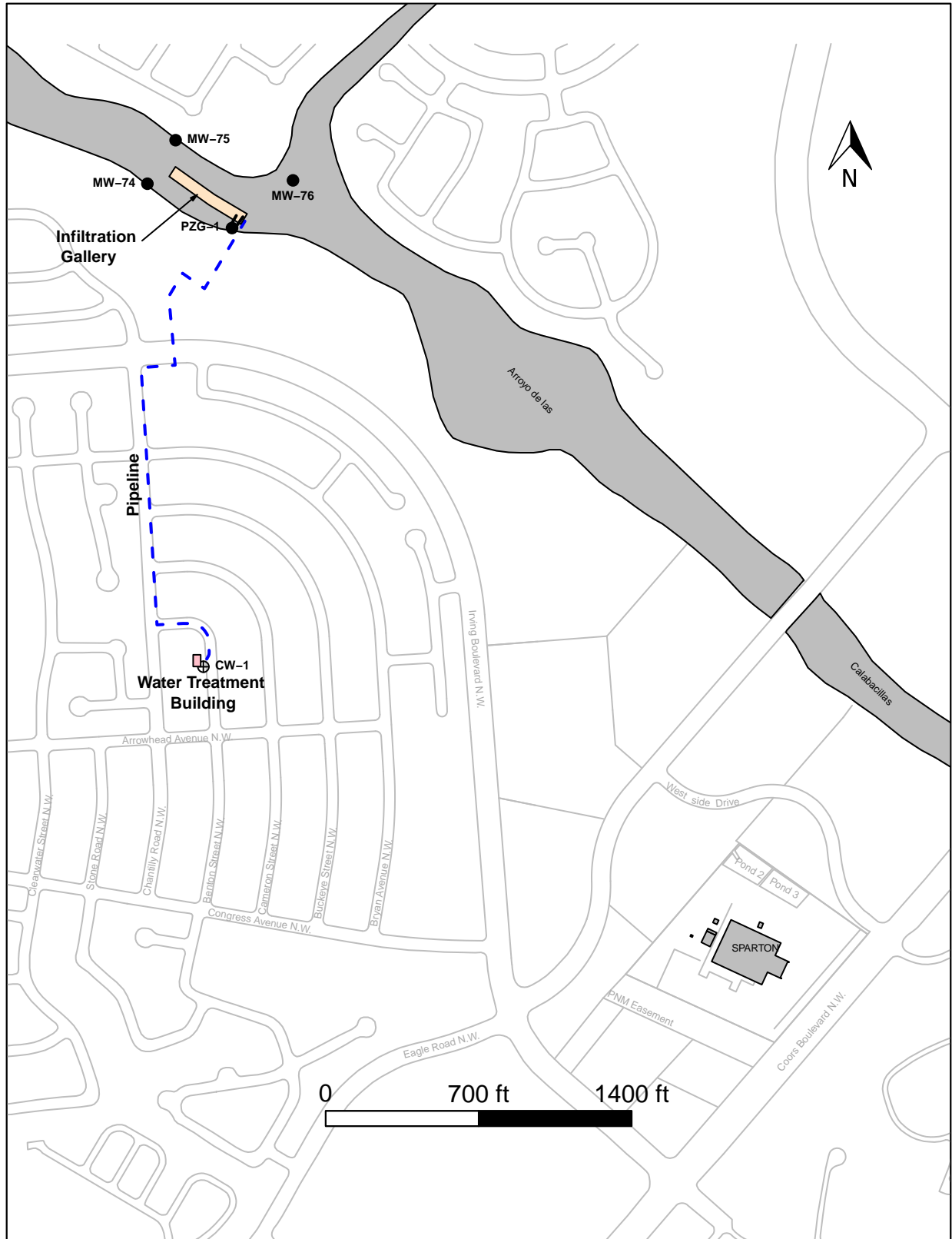


Figure 1.4: Layout of the Off-Site Containment System

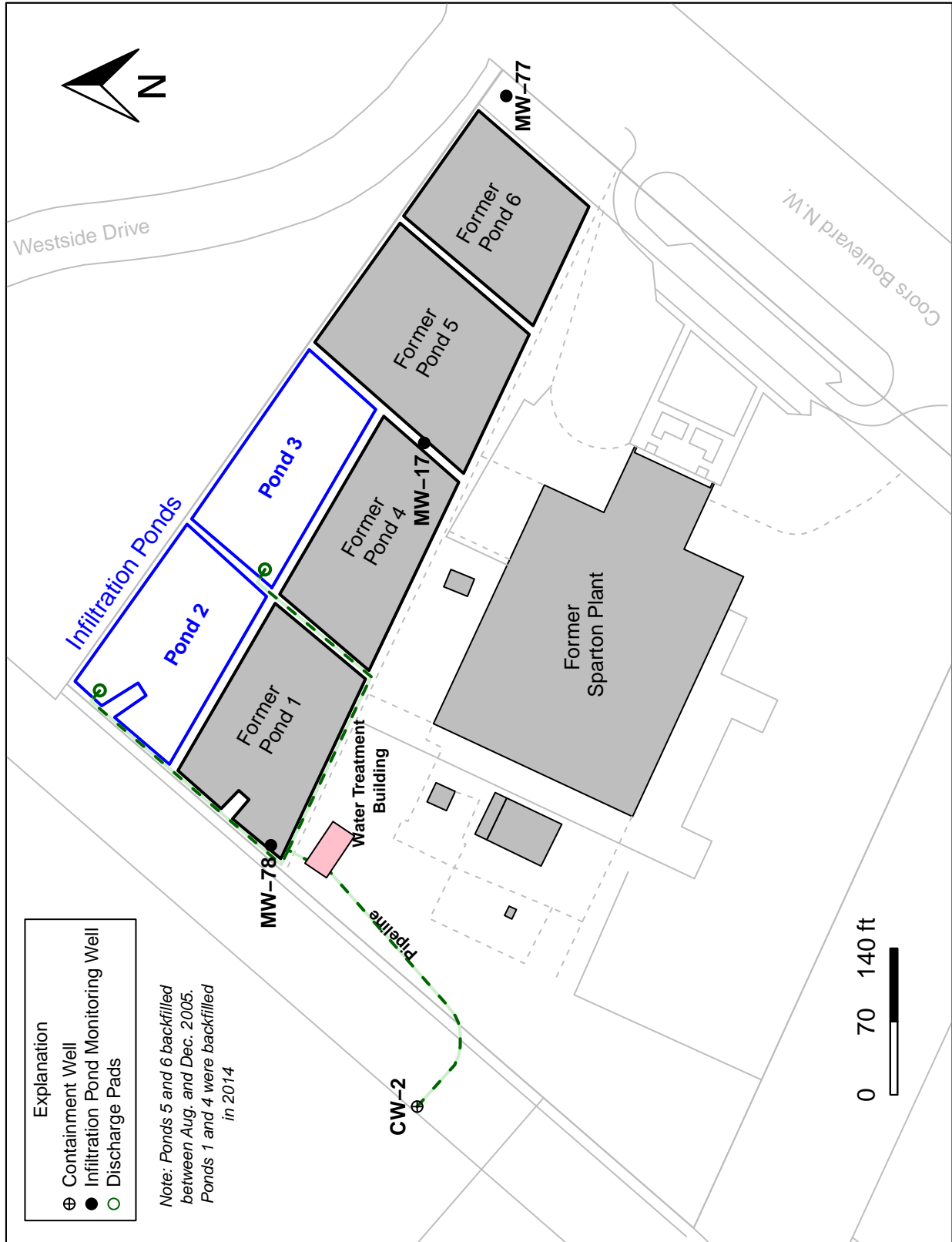


Figure 1.5: Layout of the Source Containment System

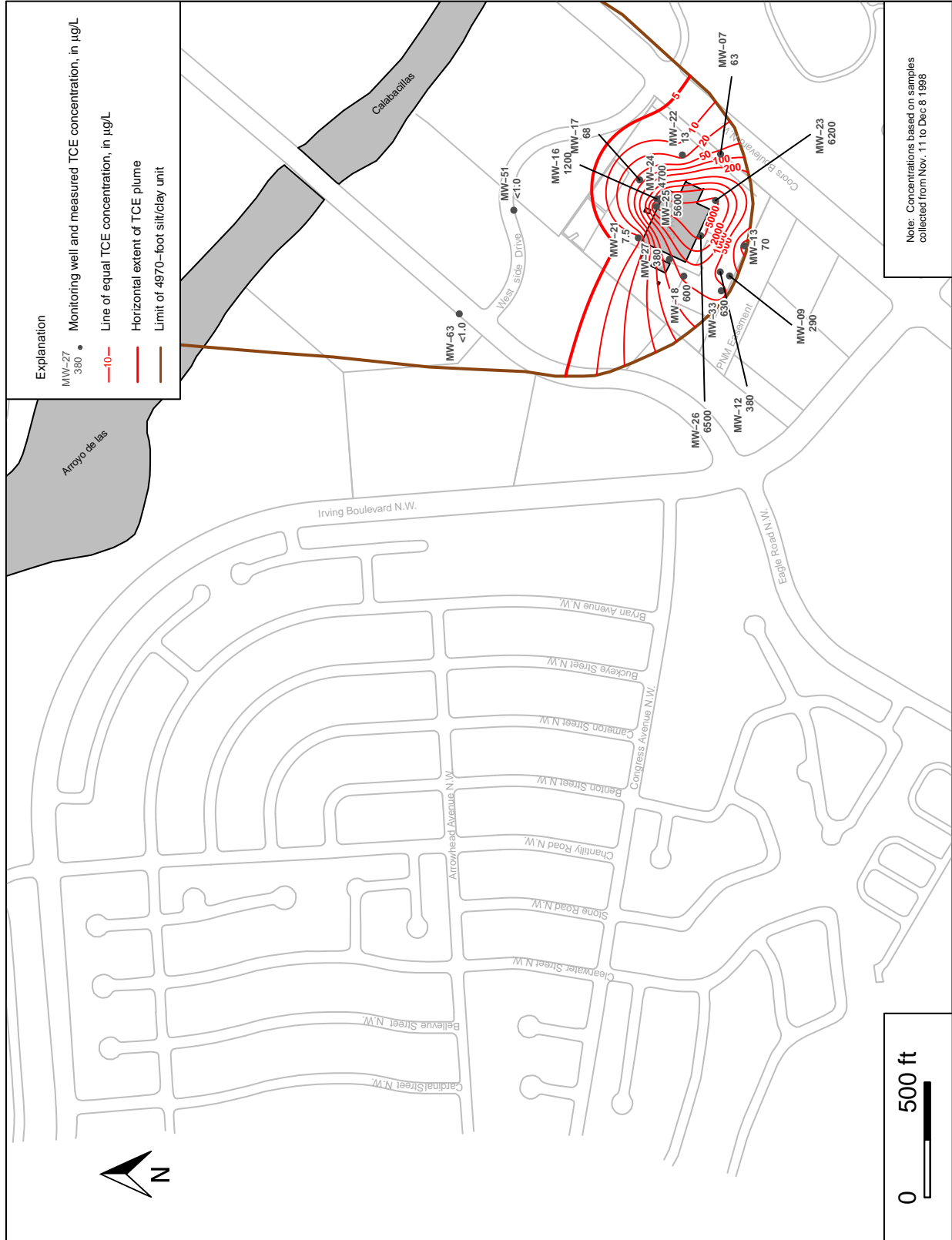


Figure 1.6: Horizontal Extent of the Initial On-Site TCE Plume

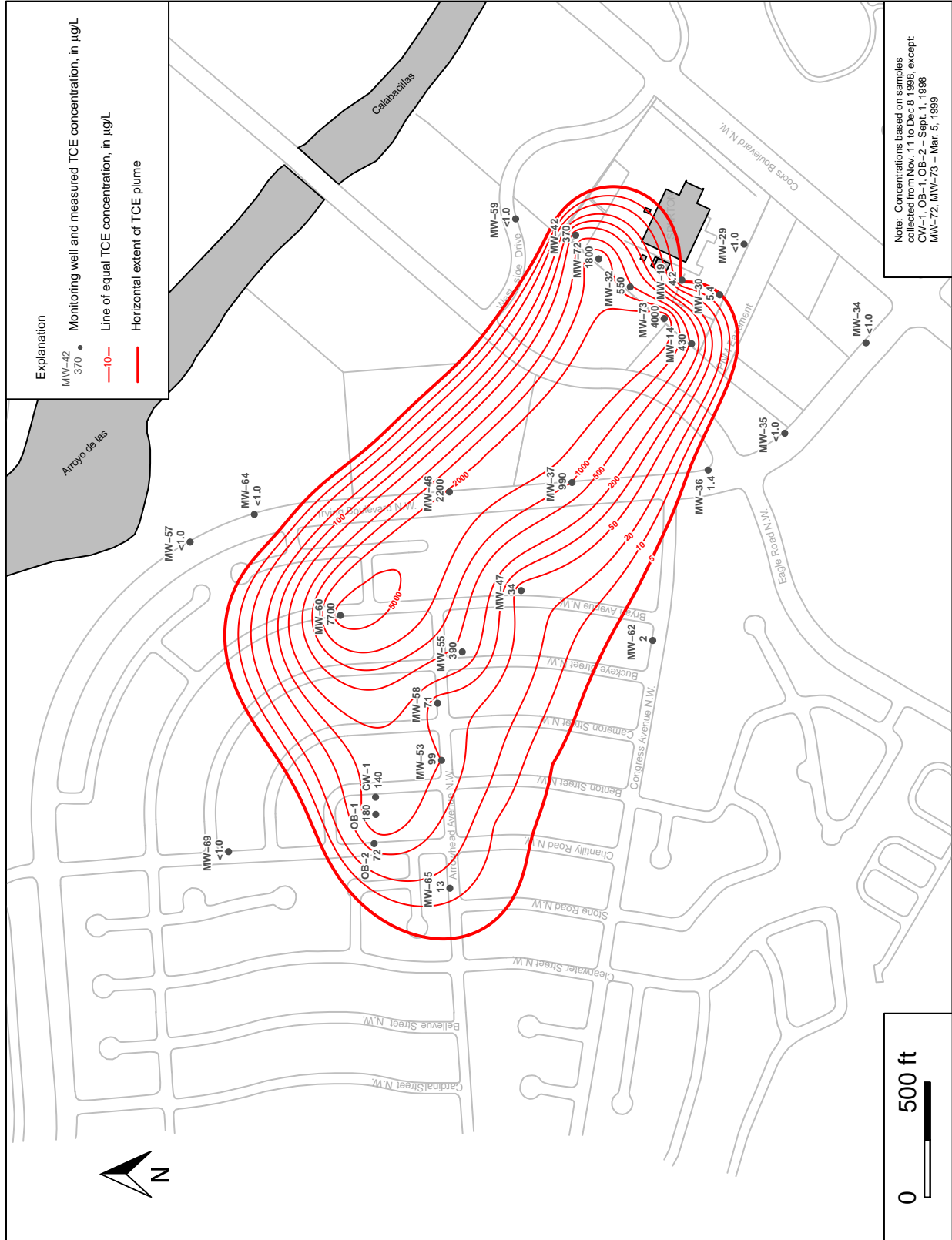


Figure 1.7: Horizontal Extent of the Initial Regional TCE Plume

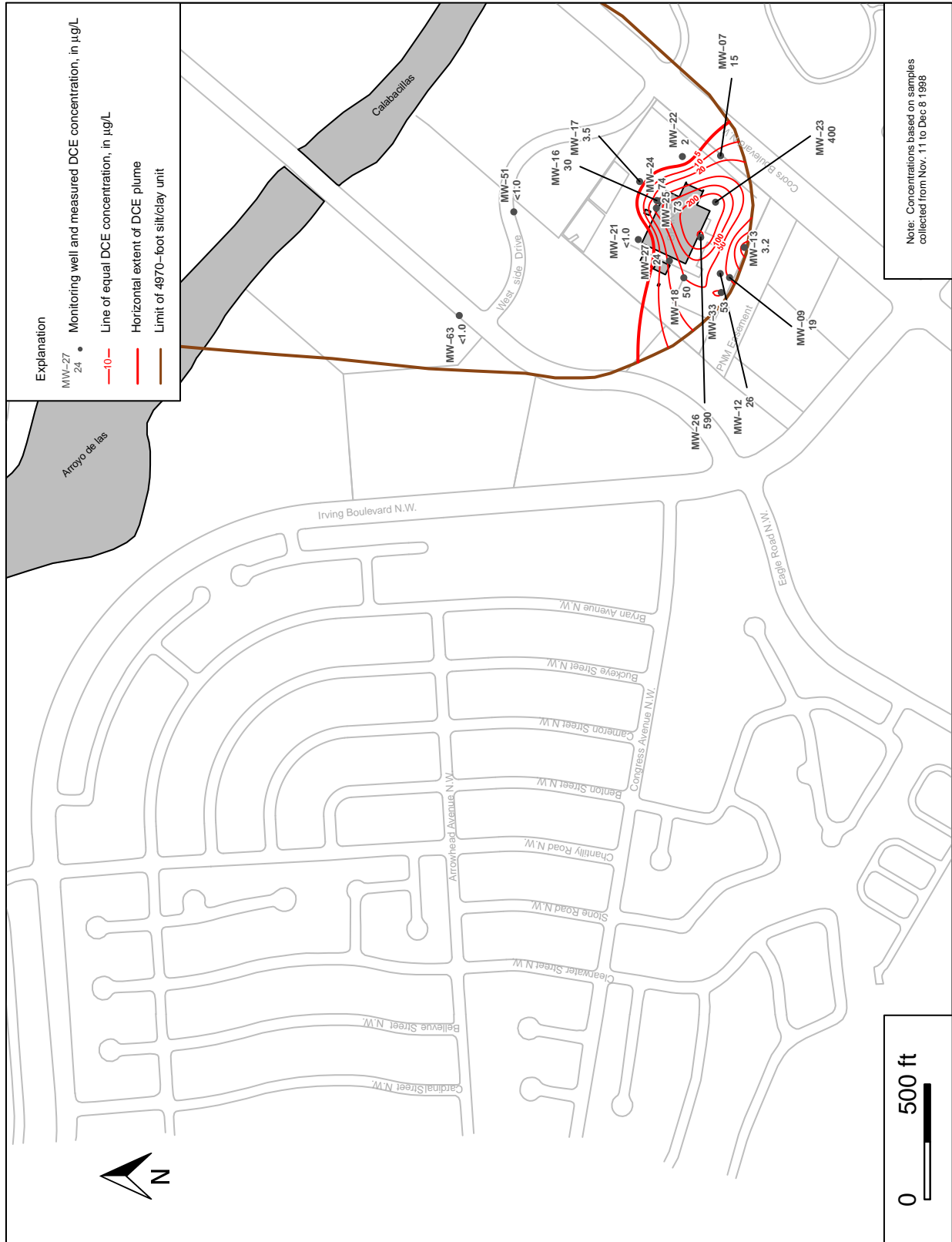


Figure 1.8: Horizontal Extent of the Initial On-Site DCE Plume

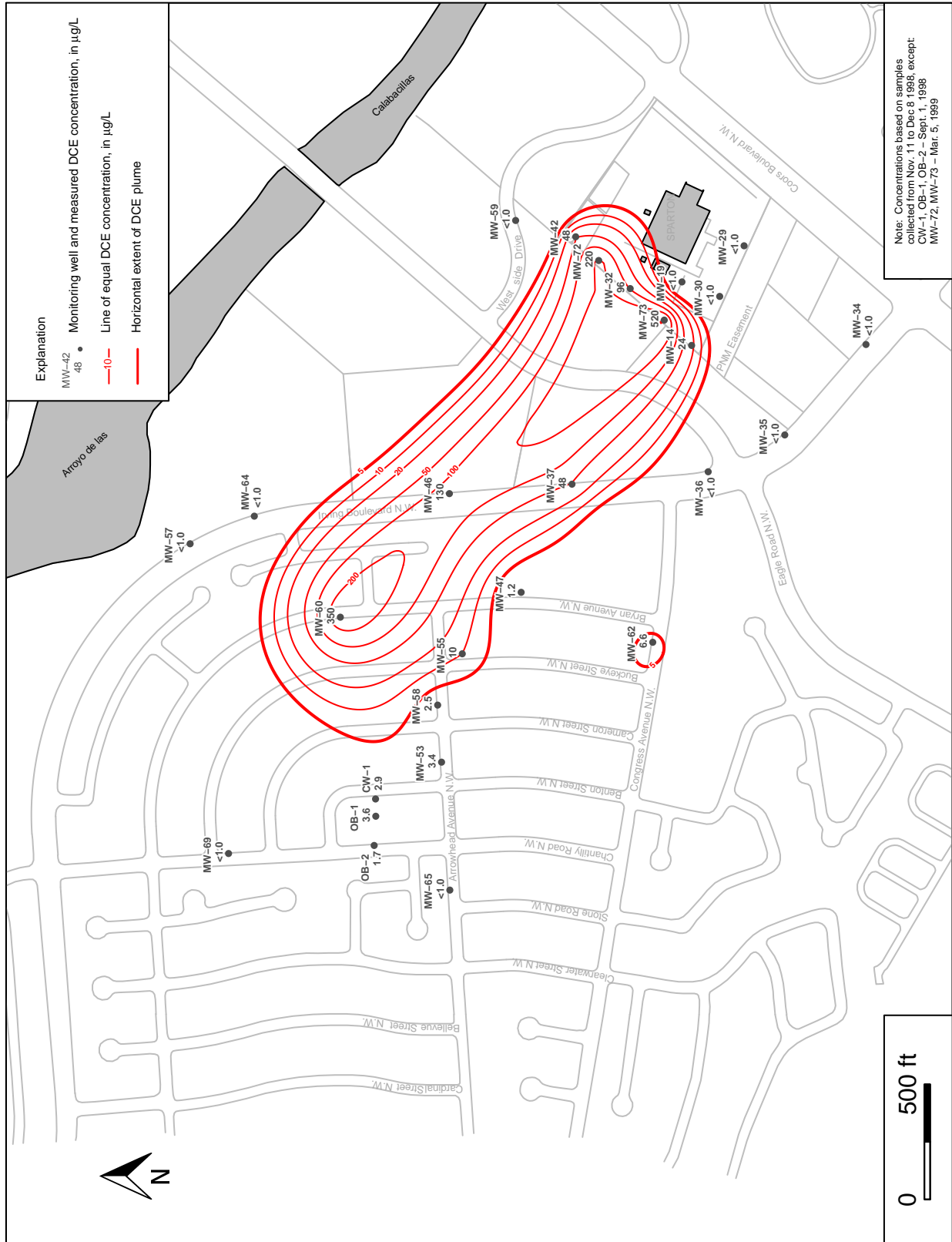


Figure 1.9: Horizontal Extent of the Initial Regional DCE Plume

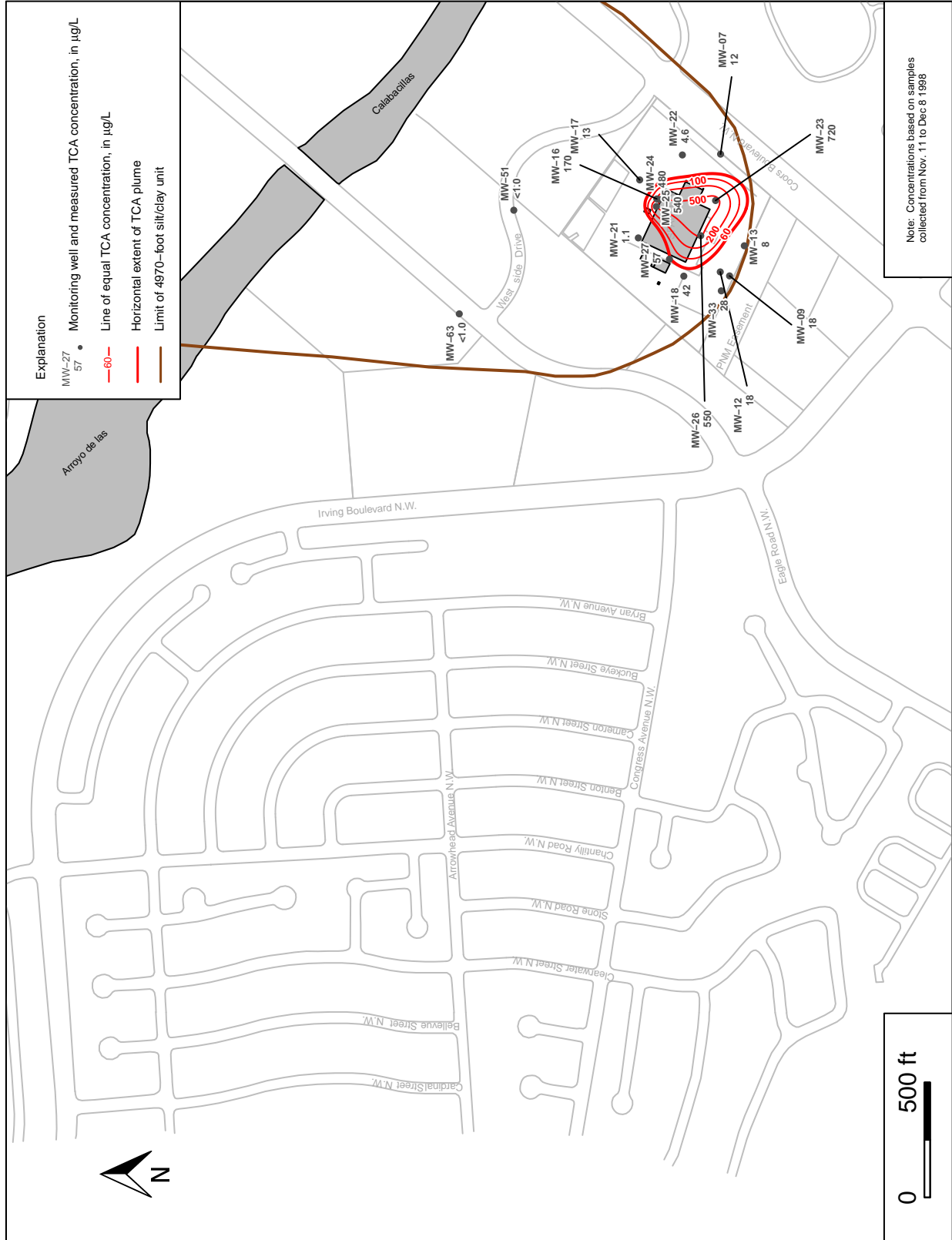


Figure 1.10: Horizontal Extent of the Initial On-Site TCA Plume

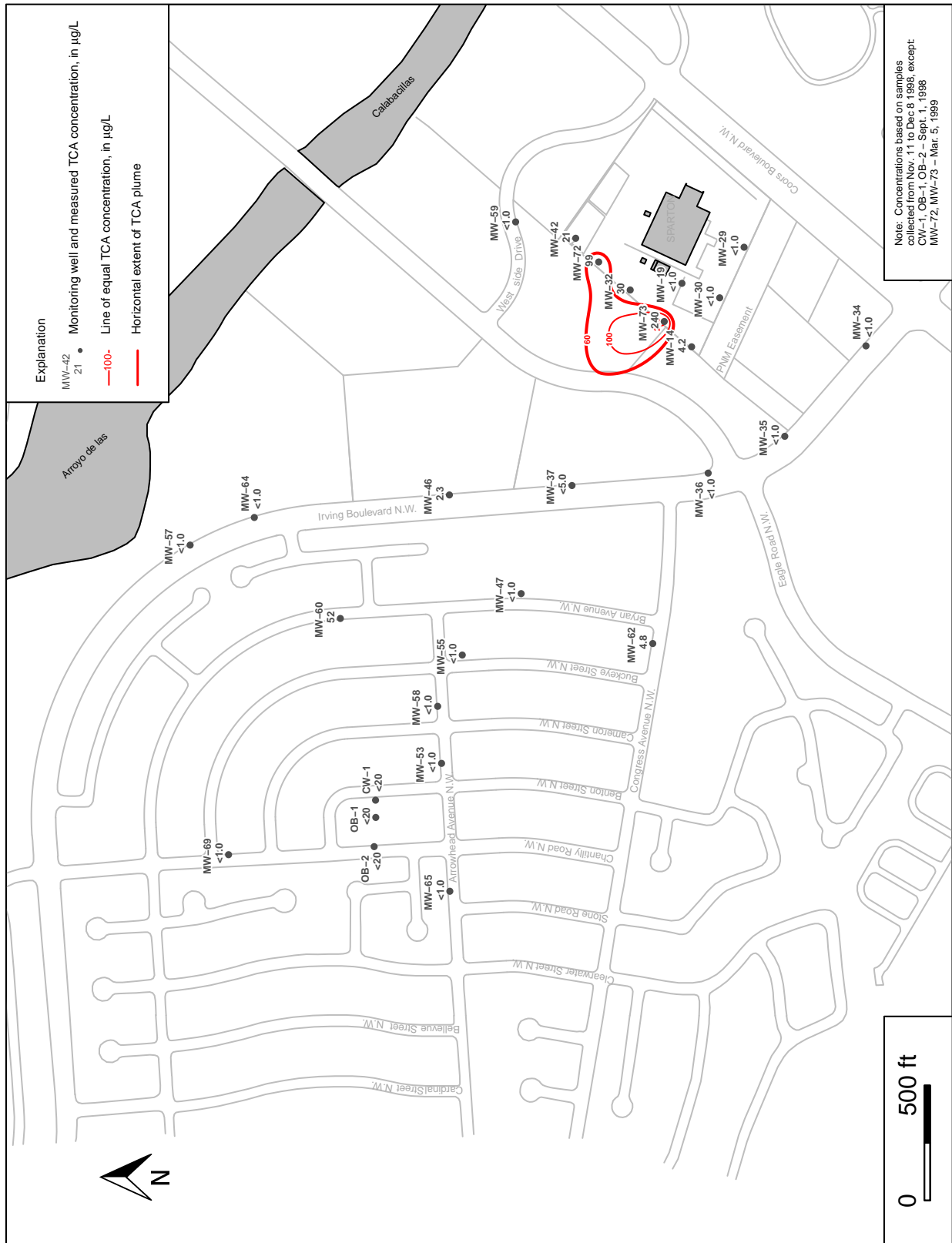


Figure 1.11: Horizontal Extent of the Initial Regional TCA Plume

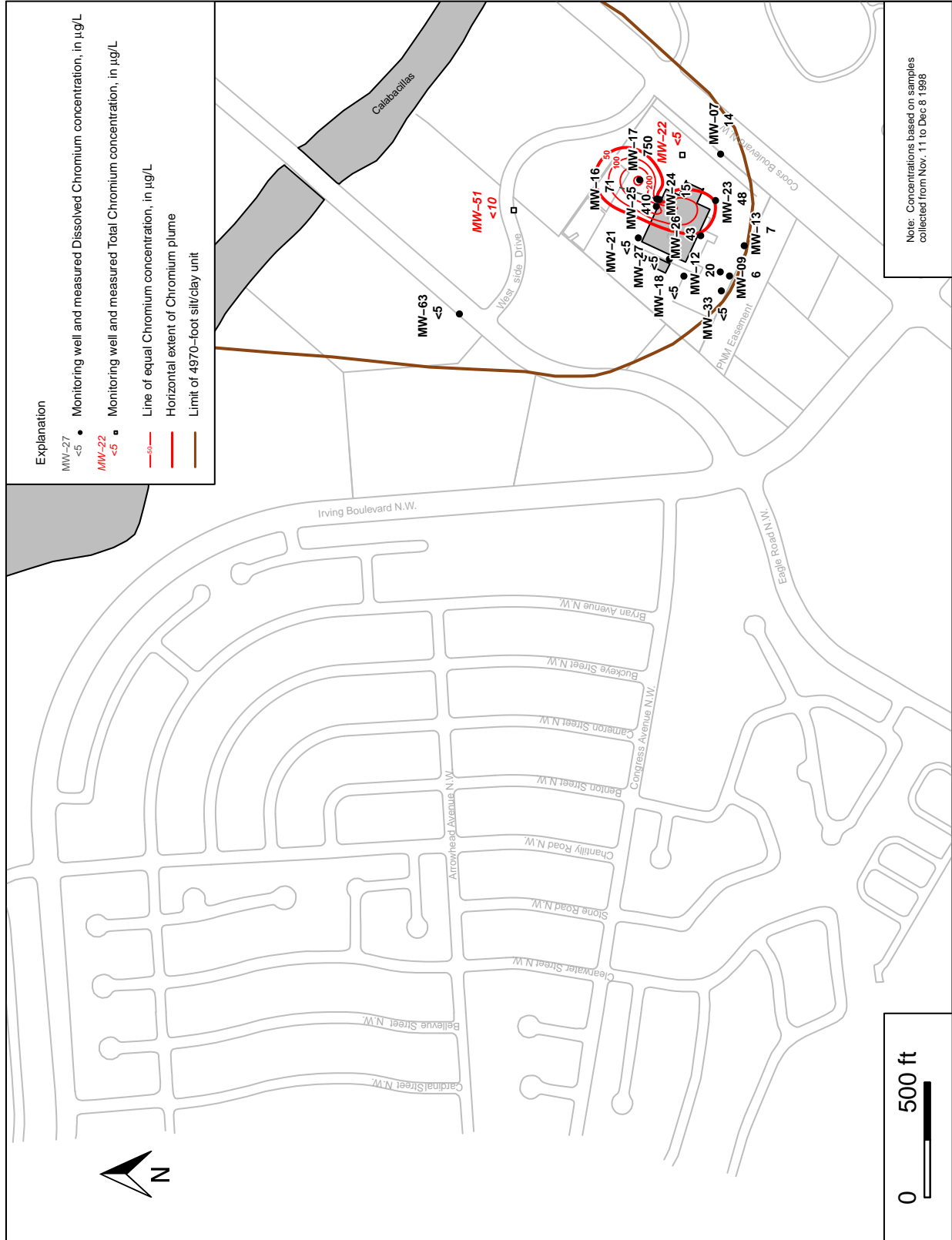


Figure 1.12: Horizontal Extent of the Initial On-Site Chromium Plume



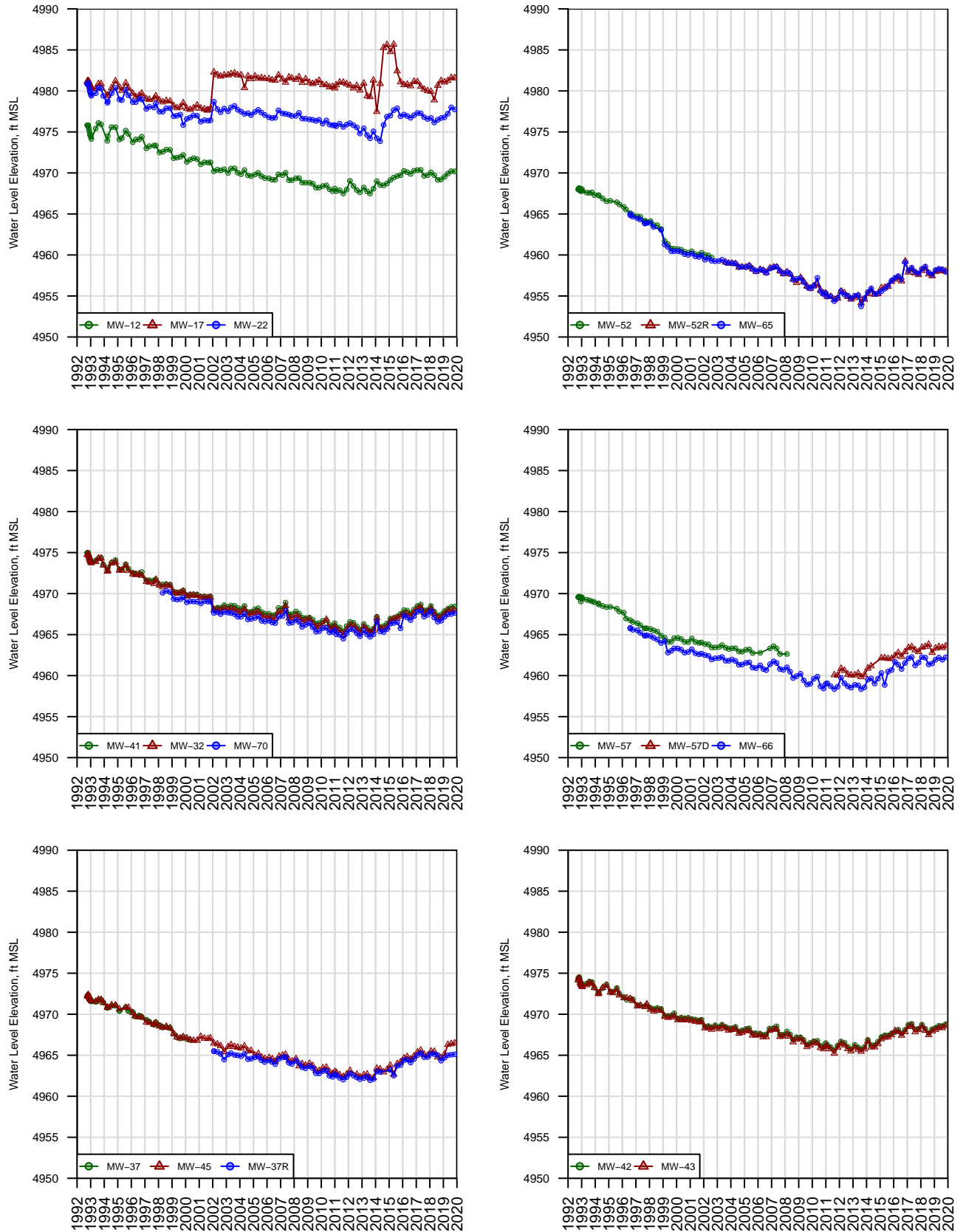


Figure 3.1: Monitoring Well Hydrographs

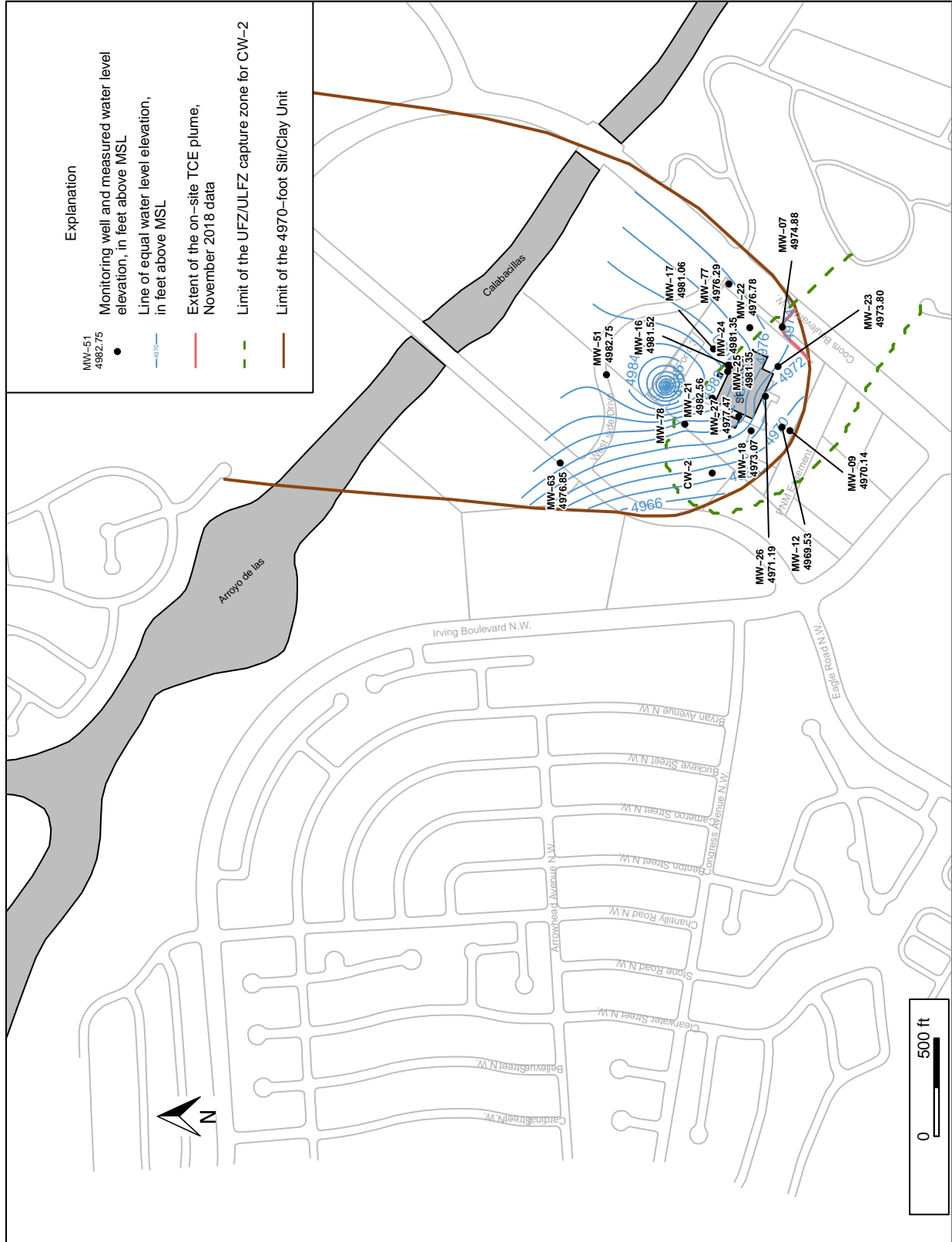


Figure 4.1: Elevation of the On-Site Water Table - February 2019

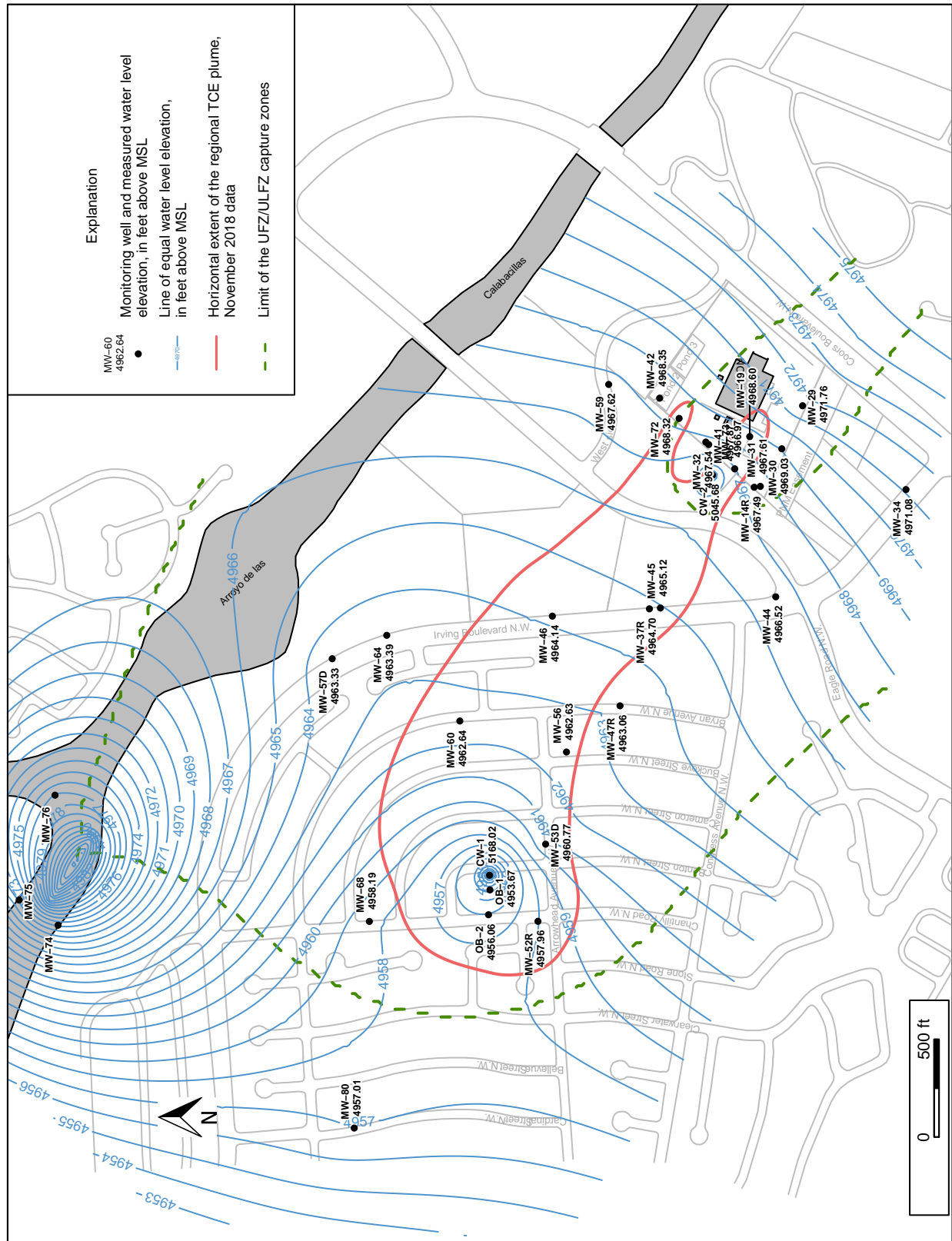


Figure 4.2: Elevation of Water Levels and Limits of Containment Well Capture Zones in the UFZ/ULFZ - February 2019

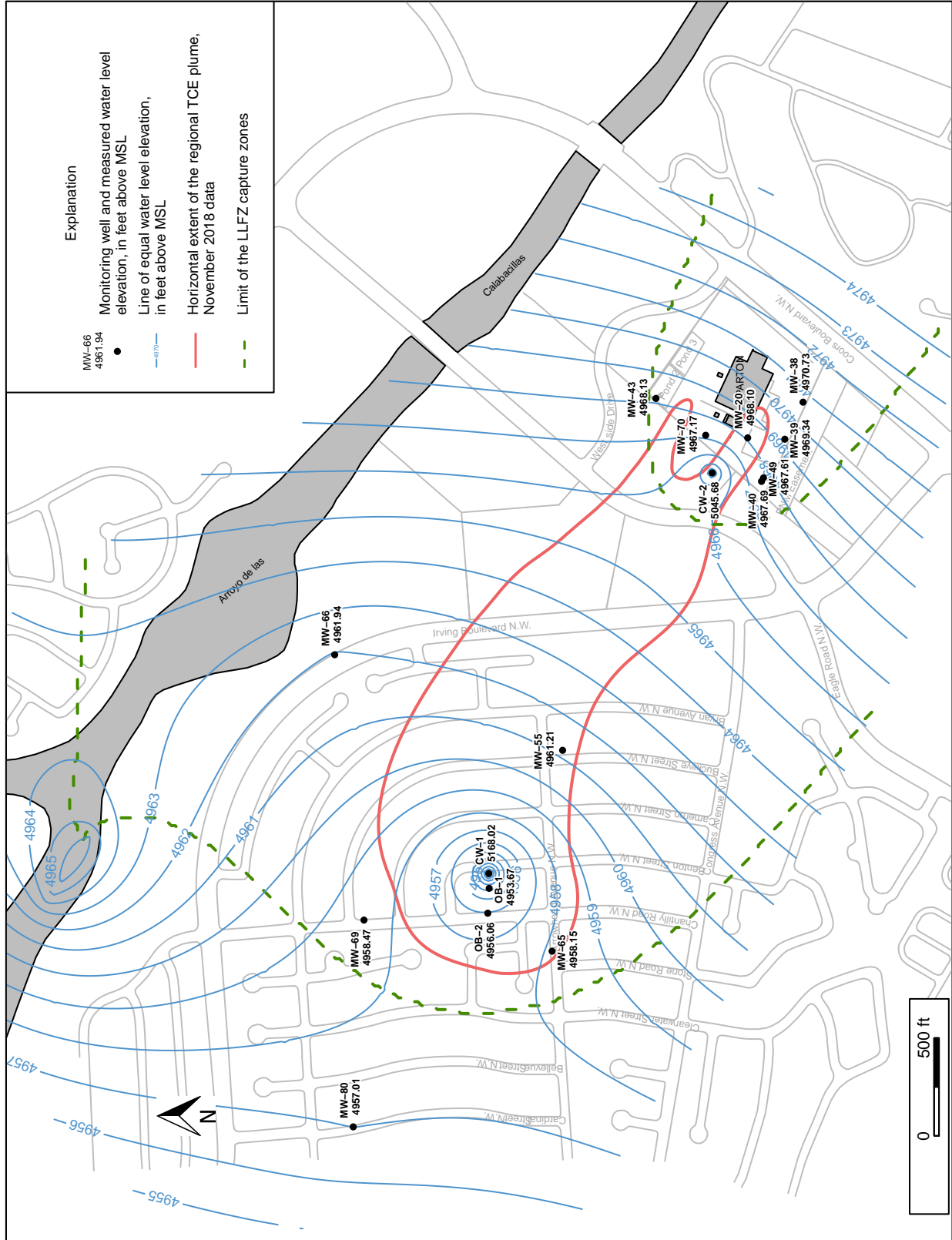


Figure 4.3: Elevation of Water Levels and Limits of Containment Well Capture Zones in the LLFZ - February 2019

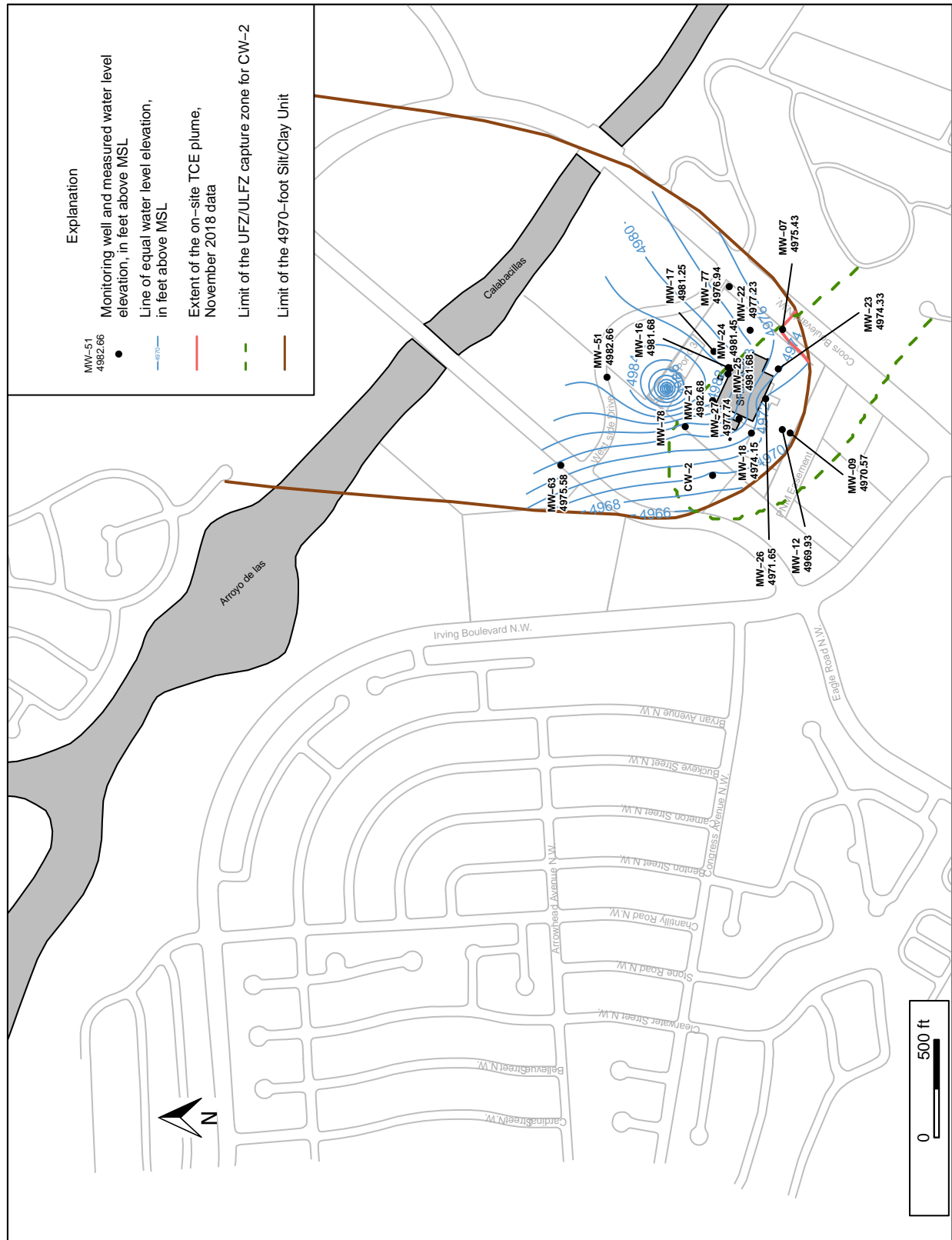


Figure 4.4: Elevation of the On-Site Water Table - May 2019

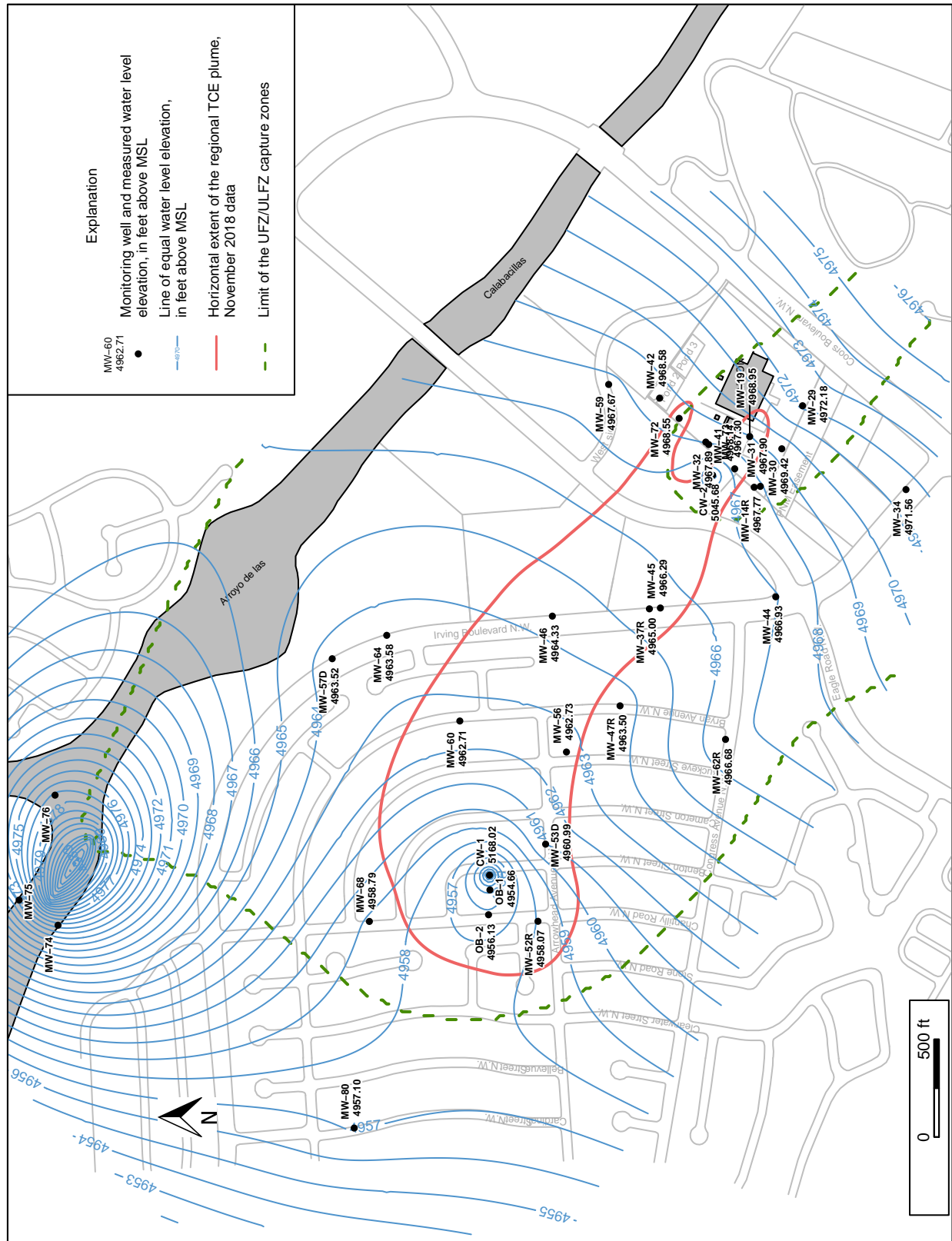


Figure 4.5: Elevation of Water Levels and Limits of Containment Well Capture Zones in the UFZ/ULFZ - May 2019



Figure 4.6: Elevation of Water Levels and Limits of Containment Well Capture Zones in the LLFZ - May 2019

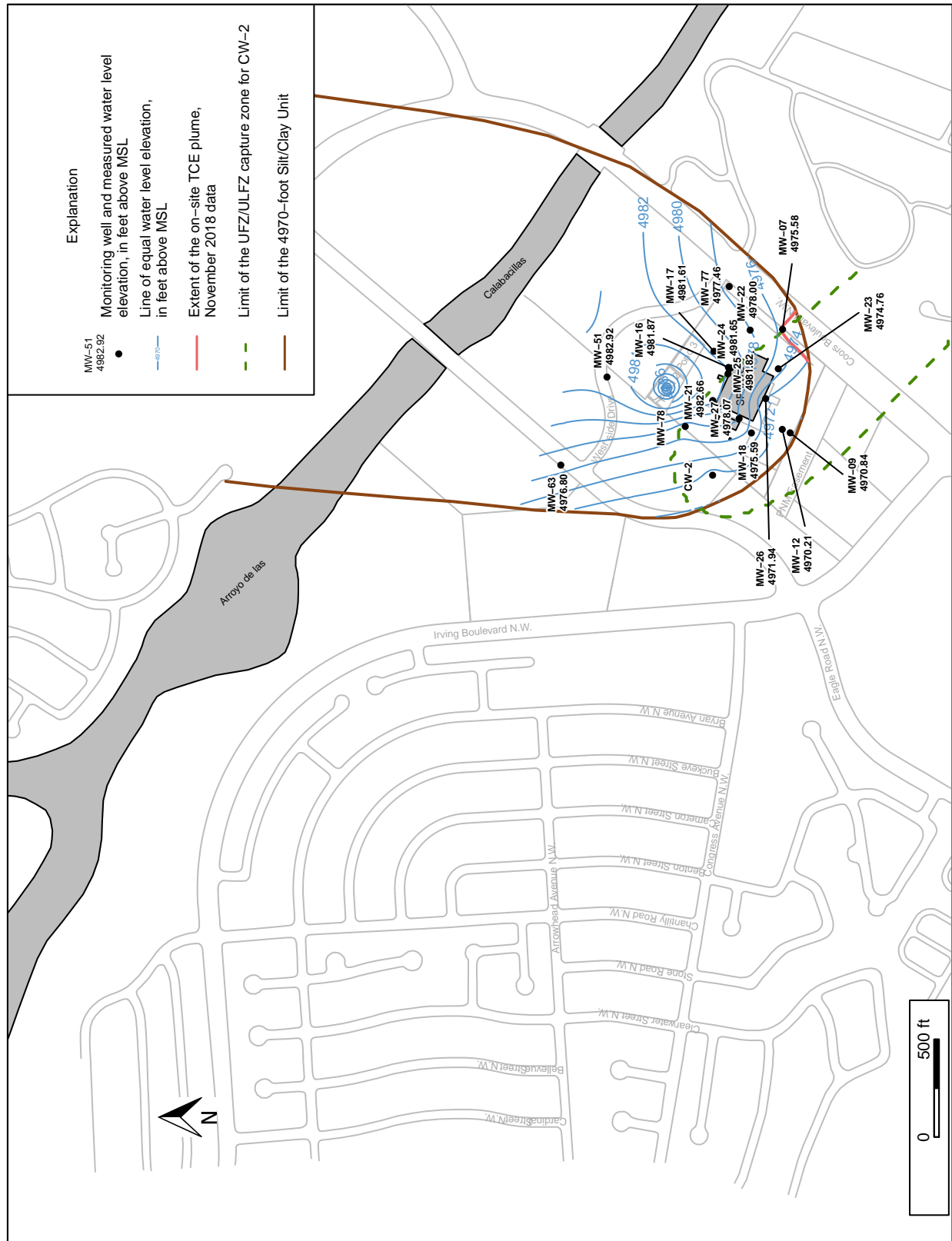


Figure 4.7: Elevation of the On-Site Water Table - August 2019

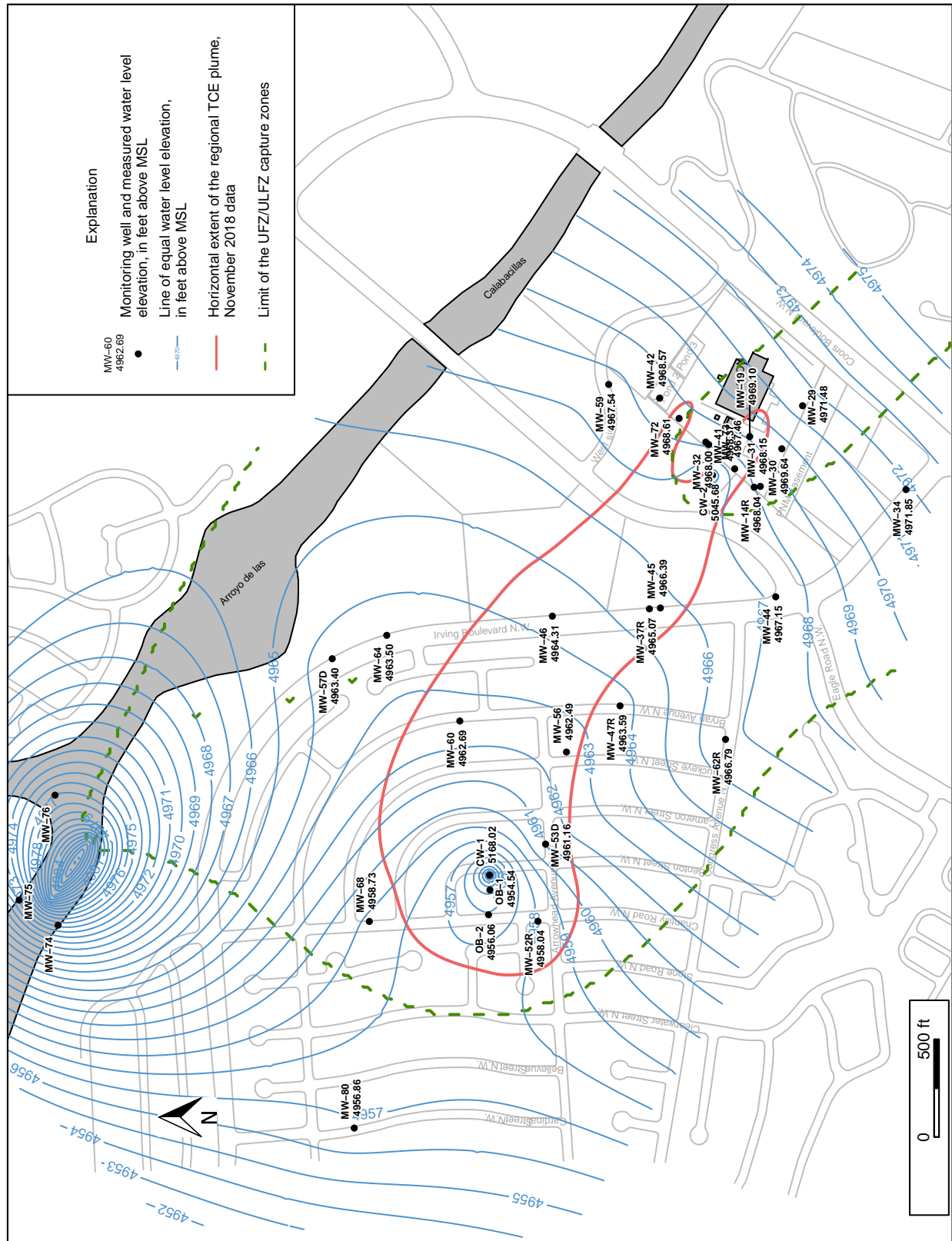


Figure 4.8: Elevation of Water Levels and Limits of Containment Well Capture Zones in the UFZ/ULFZ - August 2019

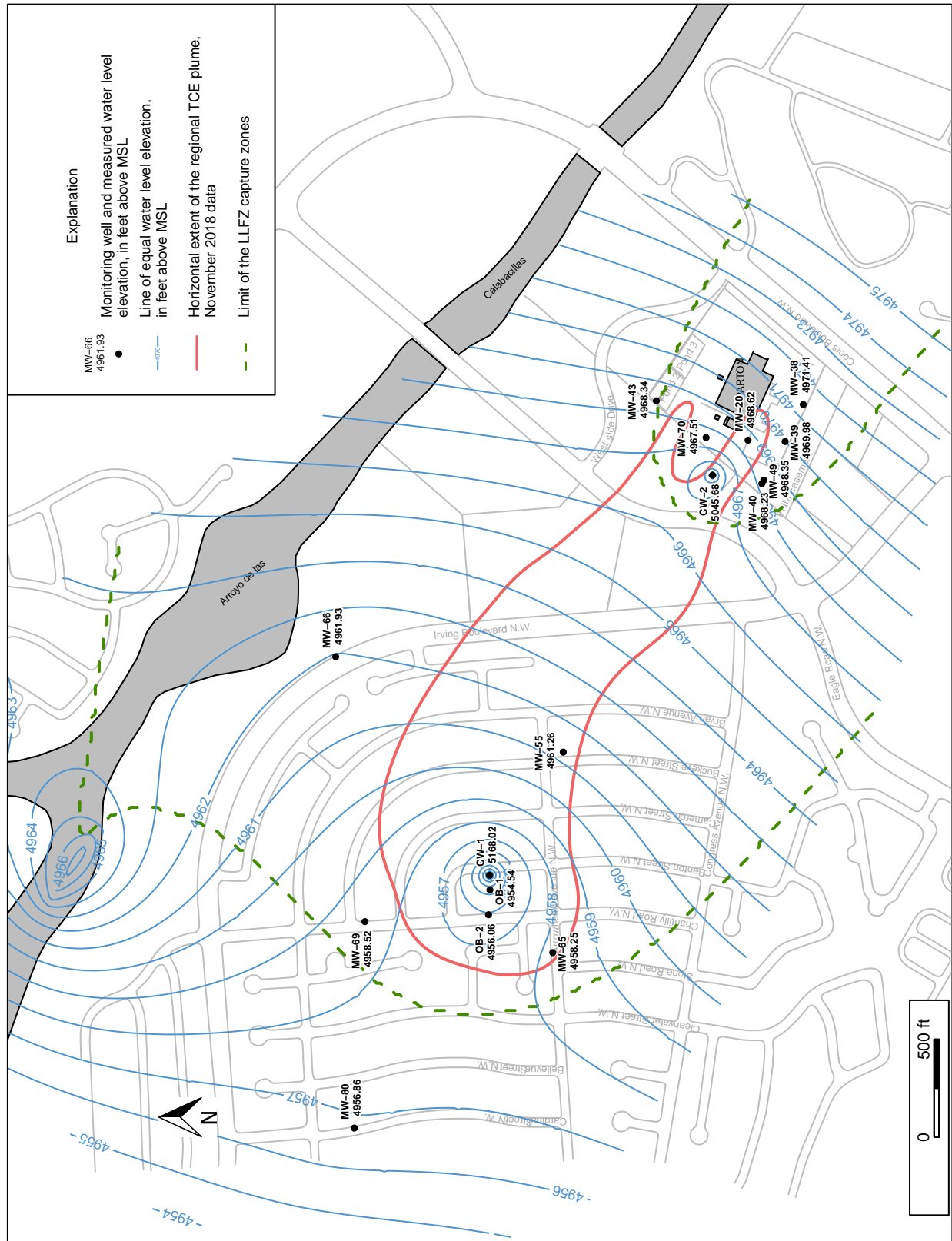


Figure 4.9: Elevation of Water Levels and Limits of Containment Well Capture Zones in the LLFZ - August 2019

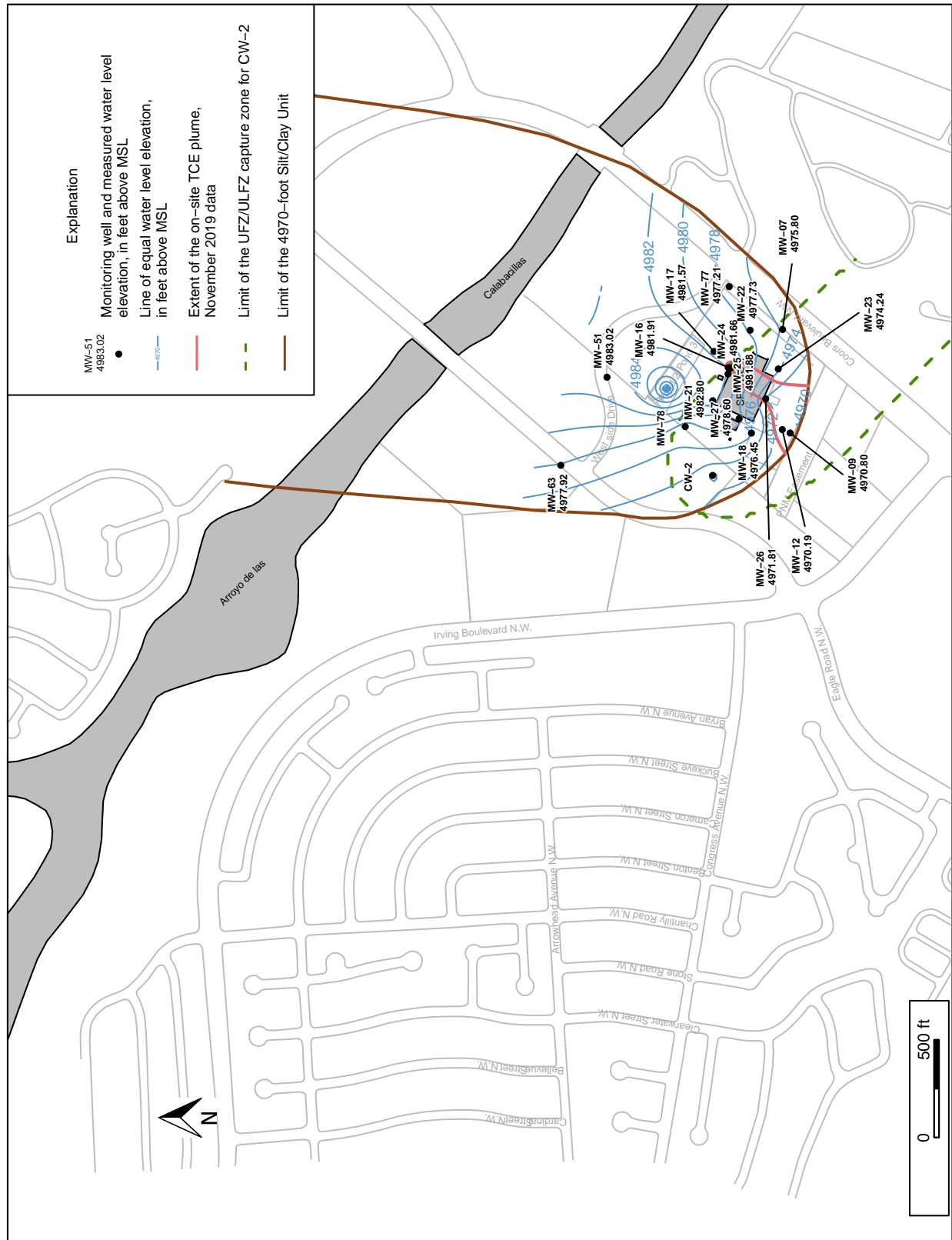


Figure 4.10: Elevation of the On-Site Water Table - November 2019



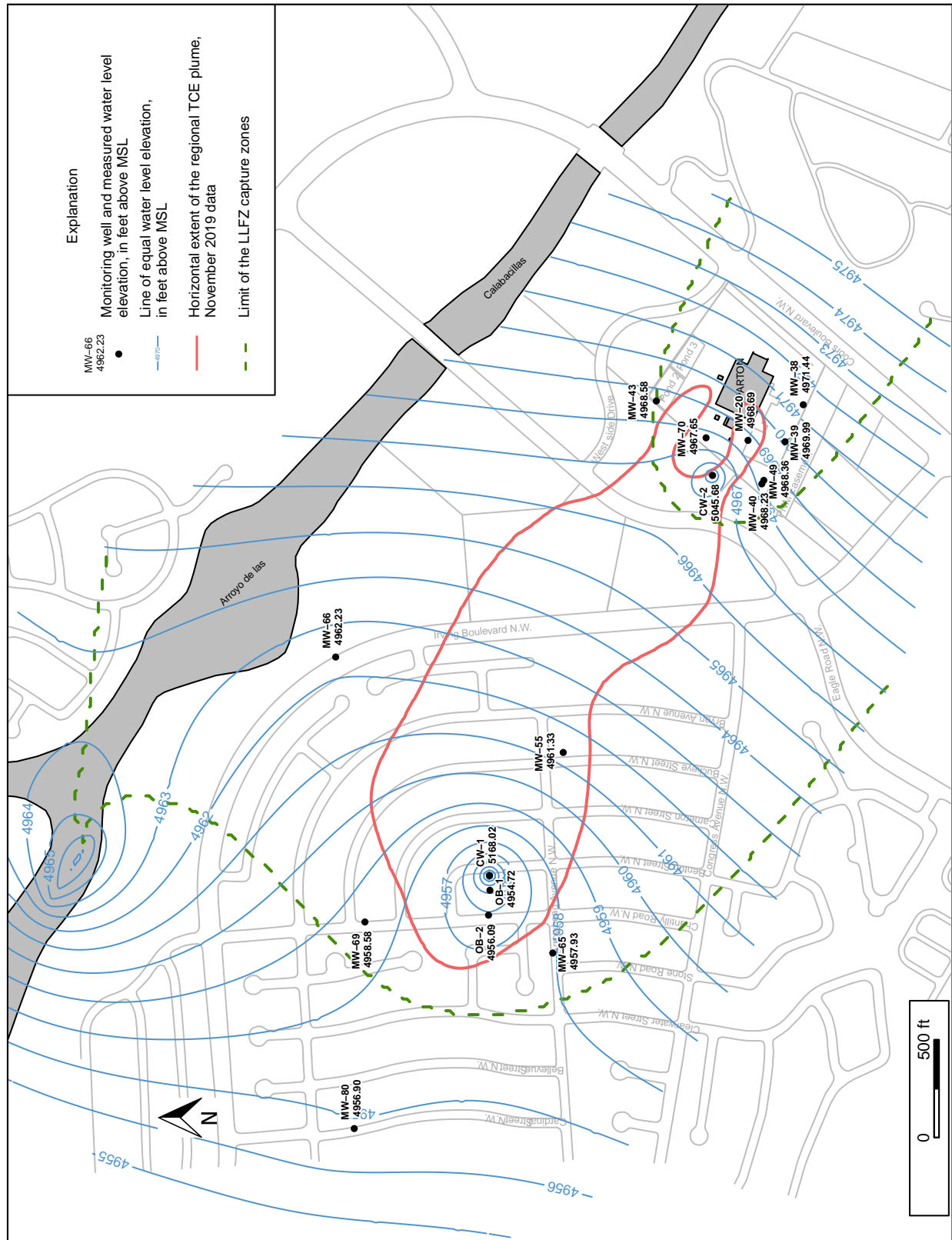


Figure 4.12: Elevation of Water Levels and Limits of Containment Well Capture Zones in the LLFZ - November 2019

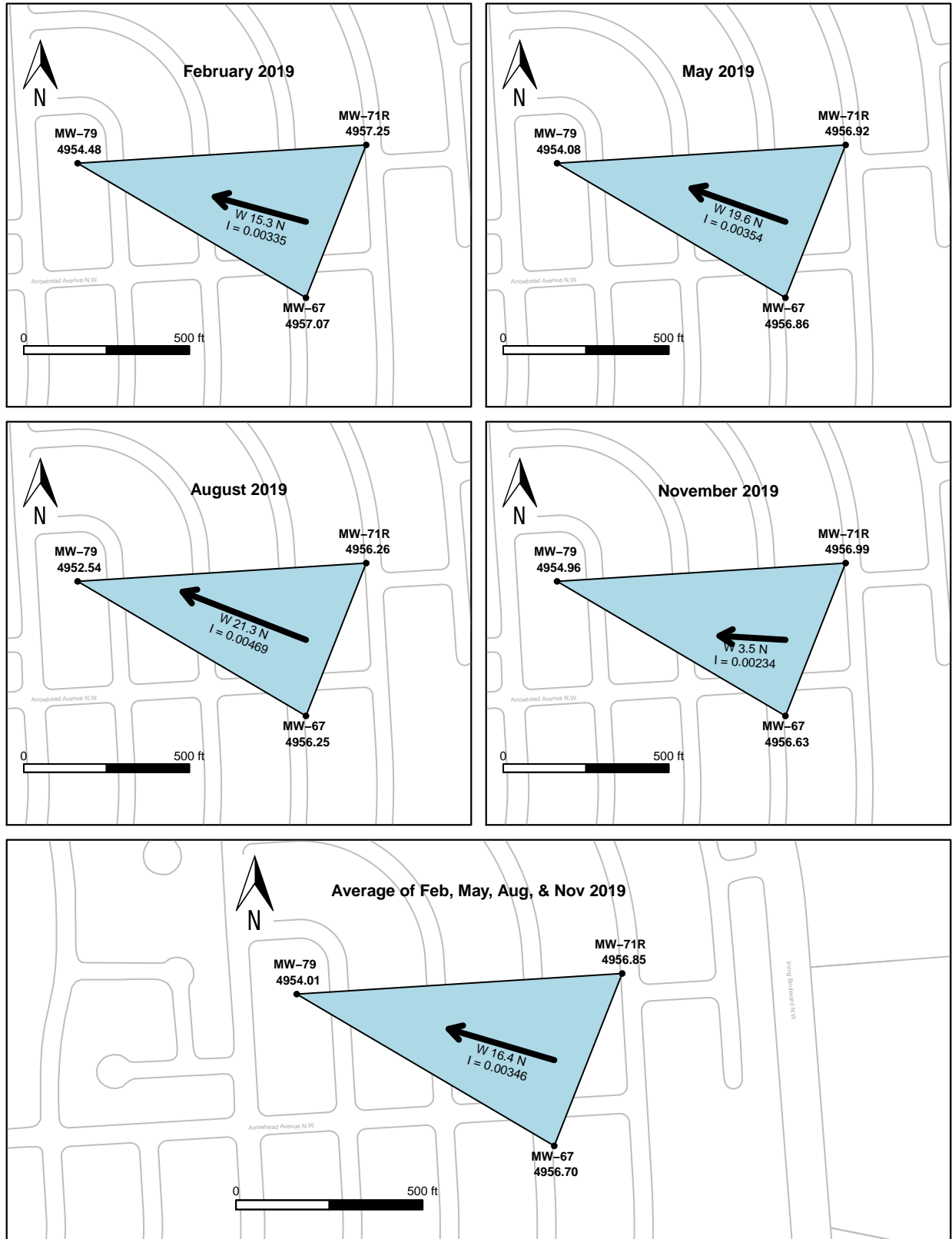
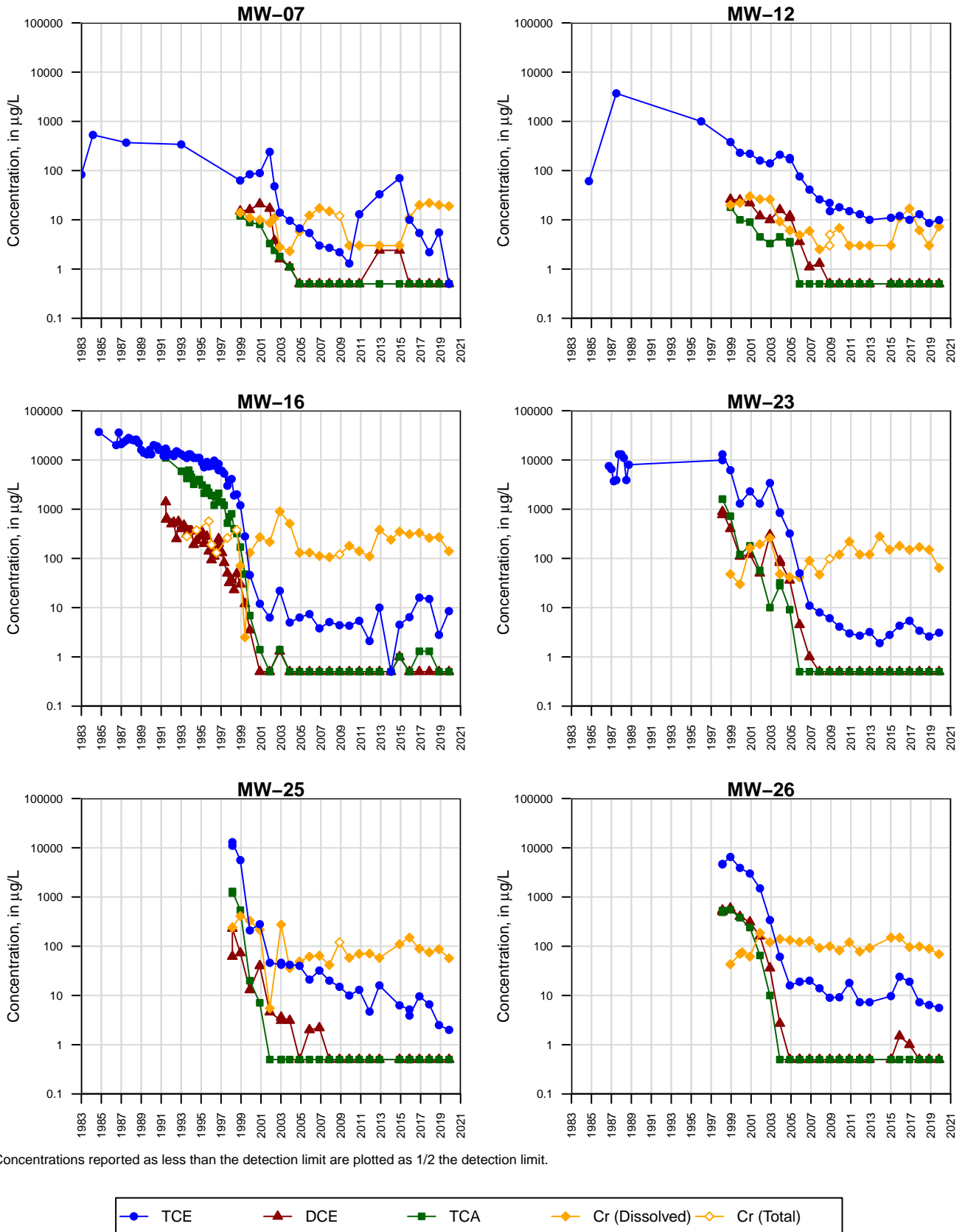


Figure 4.13: Groundwater Flow Direction and Hydraulic Gradient in the DFZ - 2019



Concentrations reported as less than the detection limit are plotted as 1/2 the detection limit.

Figure 4.14: Contaminant Concentration Trends in On-Site Wells Completed Above the 4970-ft Silt/Clay

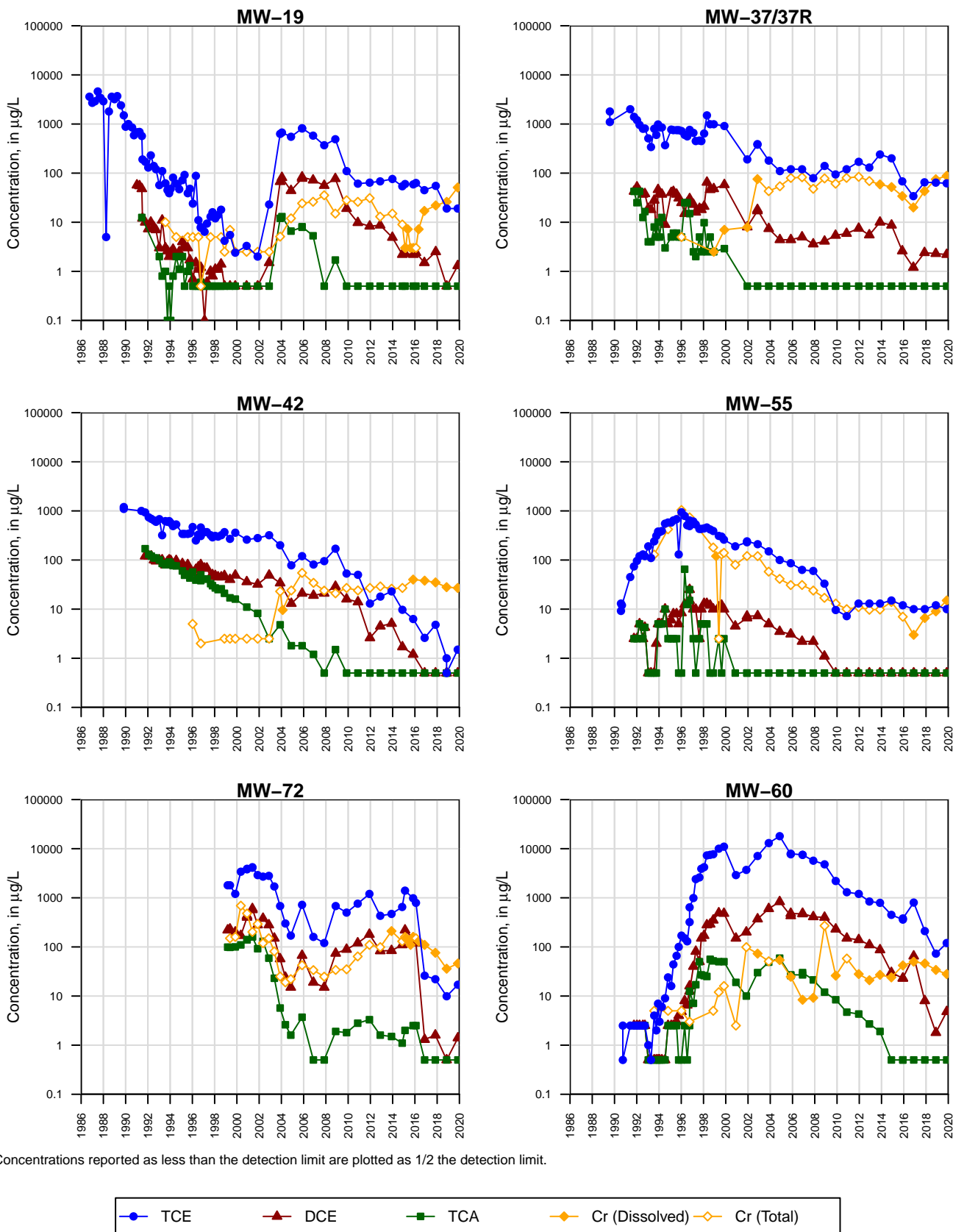


Figure 4.15: Contaminant Concentration Trends in On-Site Wells Completed Below the 4970-ft Silt/Clay and in Off-Site Wells

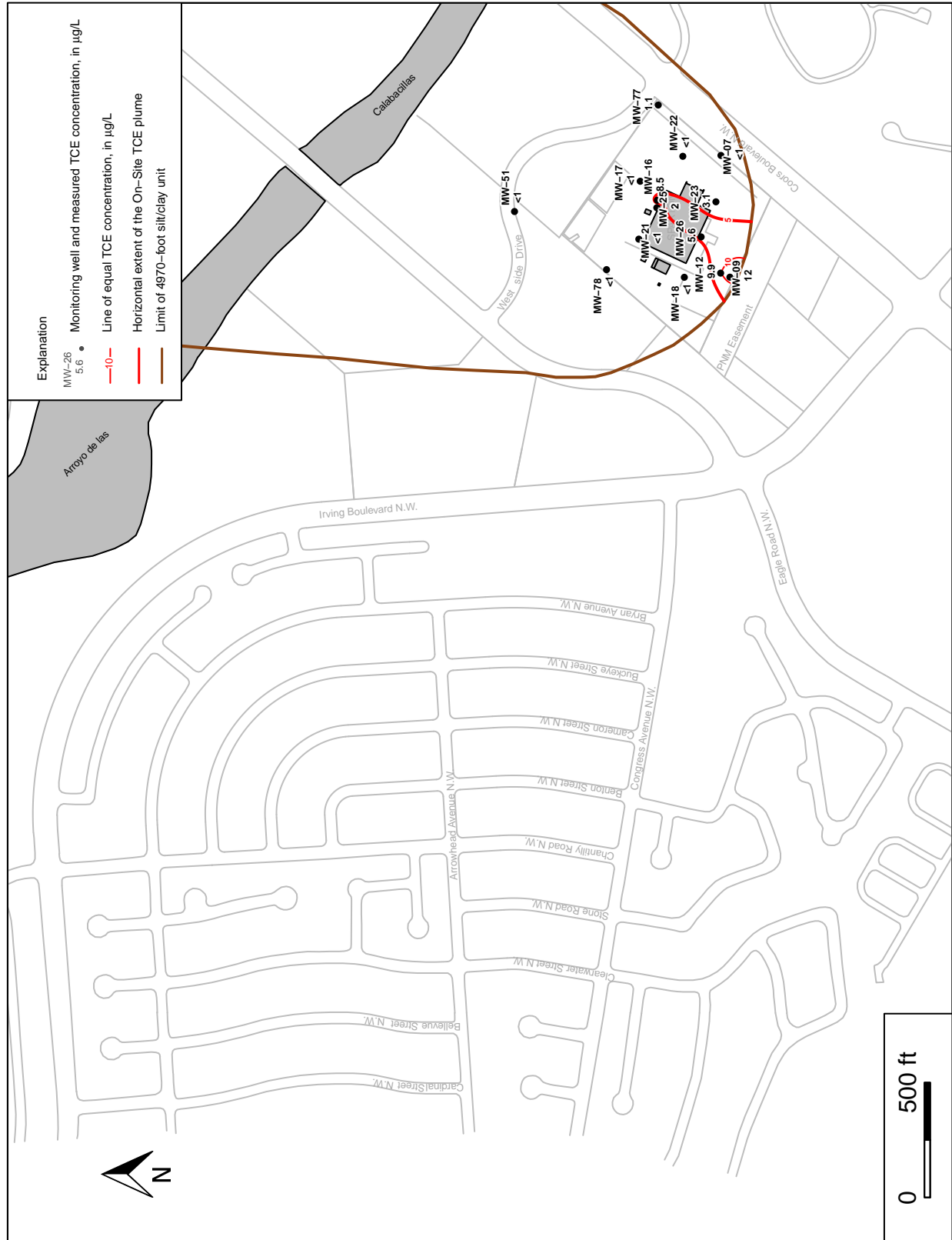


Figure 4.16: Horizontal Extent of the On-Site TCE Plume - November 2019

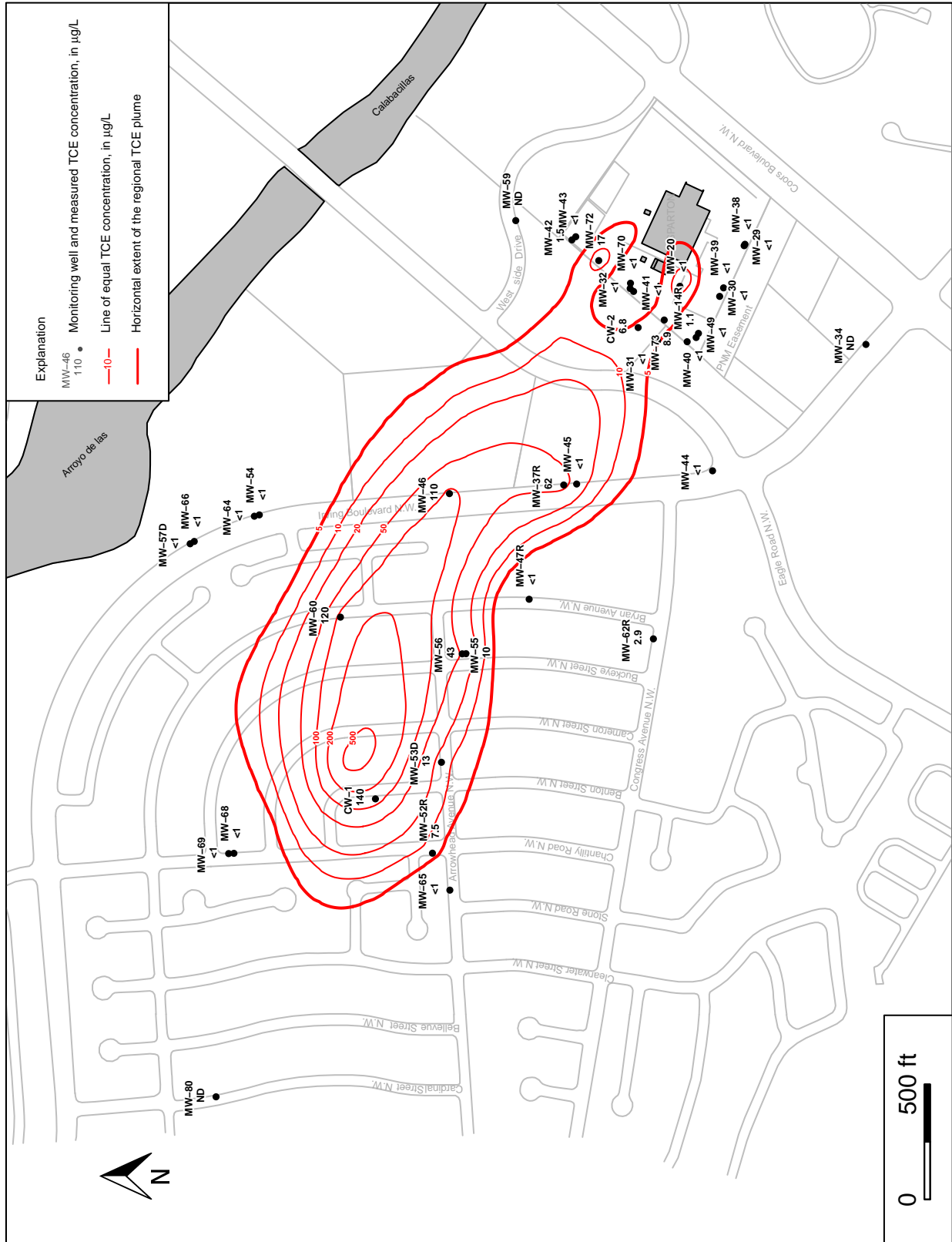


Figure 4.17: Horizontal Extent of the Regional TCE Plume - November 2019

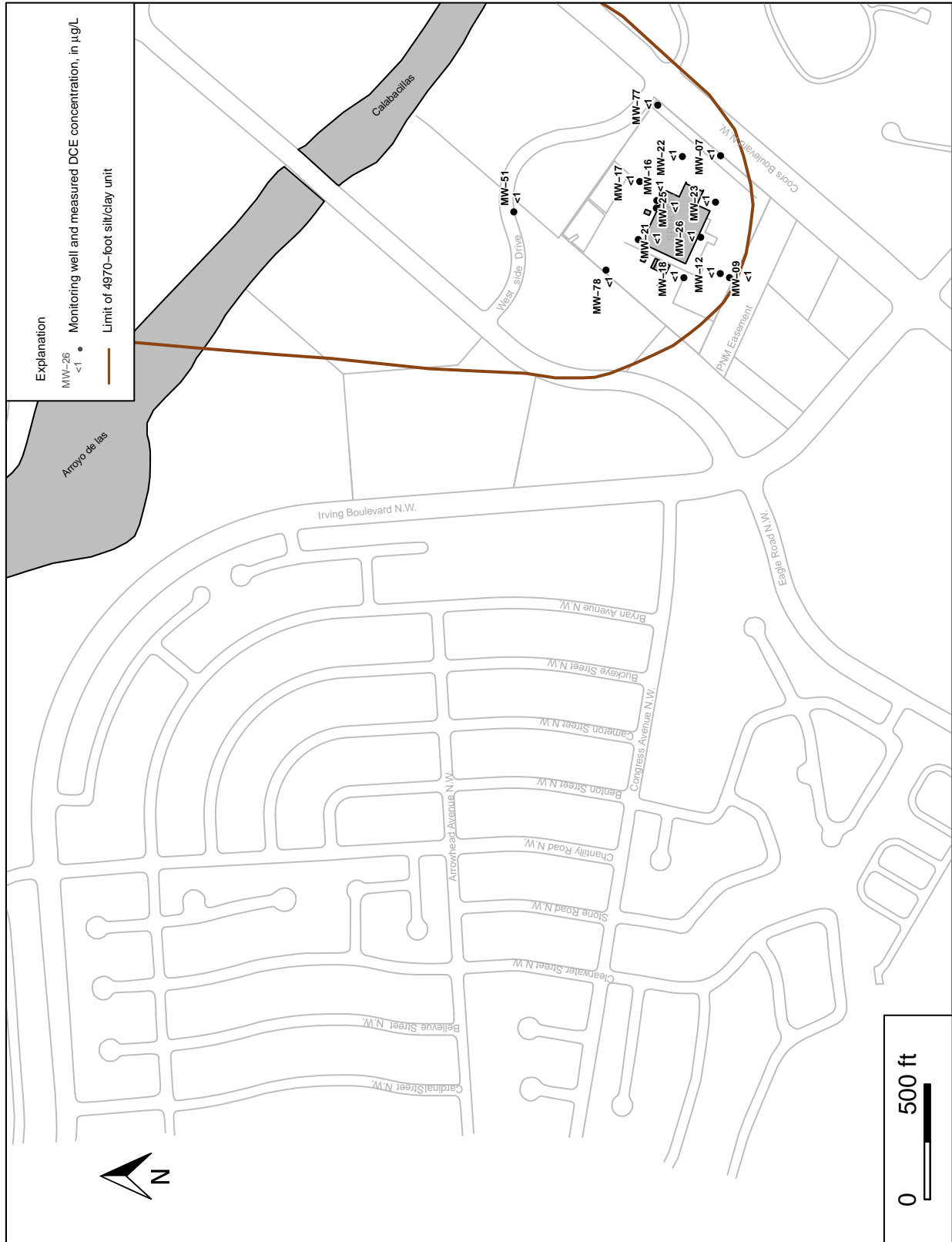


Figure 4.18: On-Site DCE Concentrations - November 2019

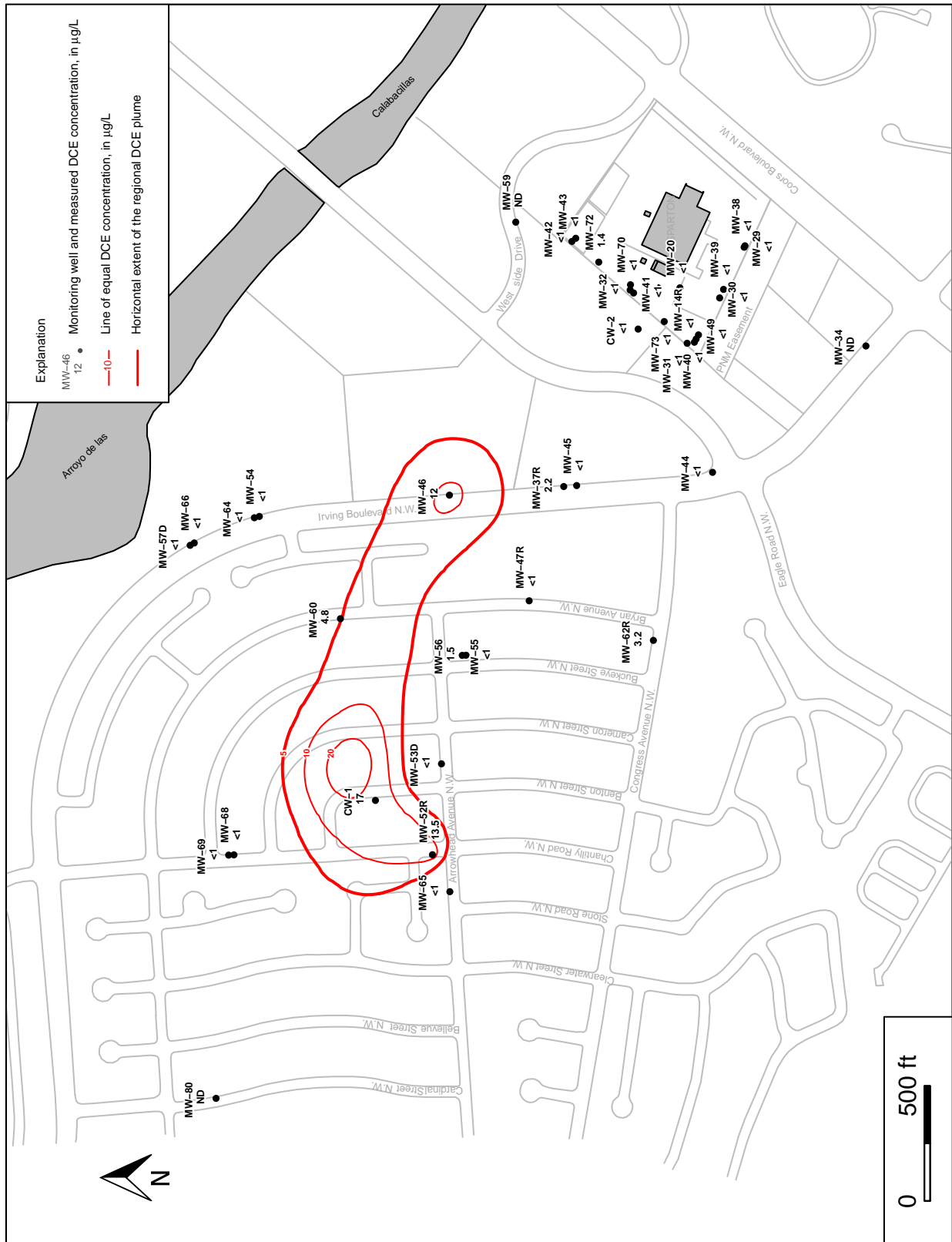


Figure 4.19: Horizontal Extent of the Regional DCE Plume - November 2019

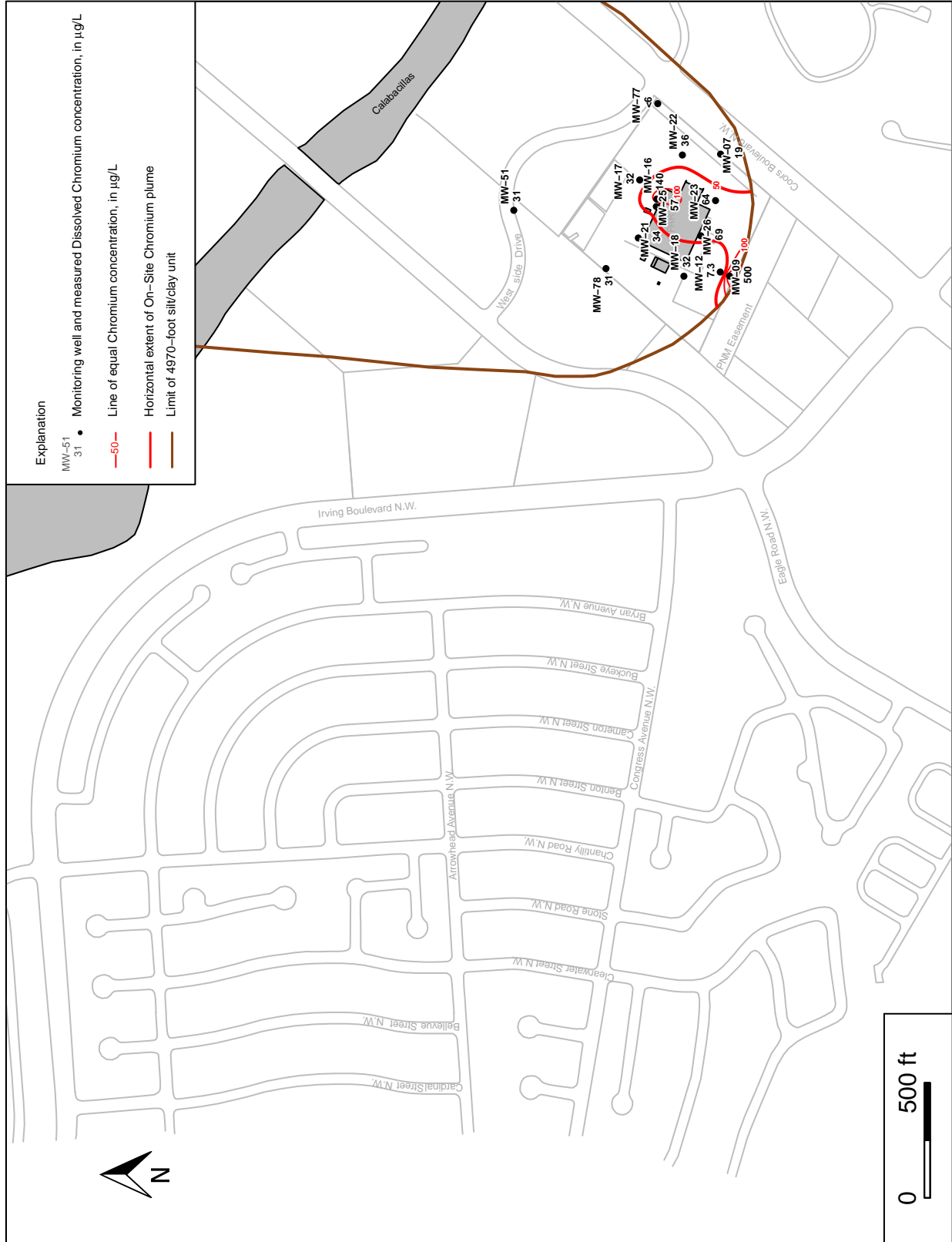


Figure 4.20: Horizontal Extent of the On-Site Chromium Plume - November 2019

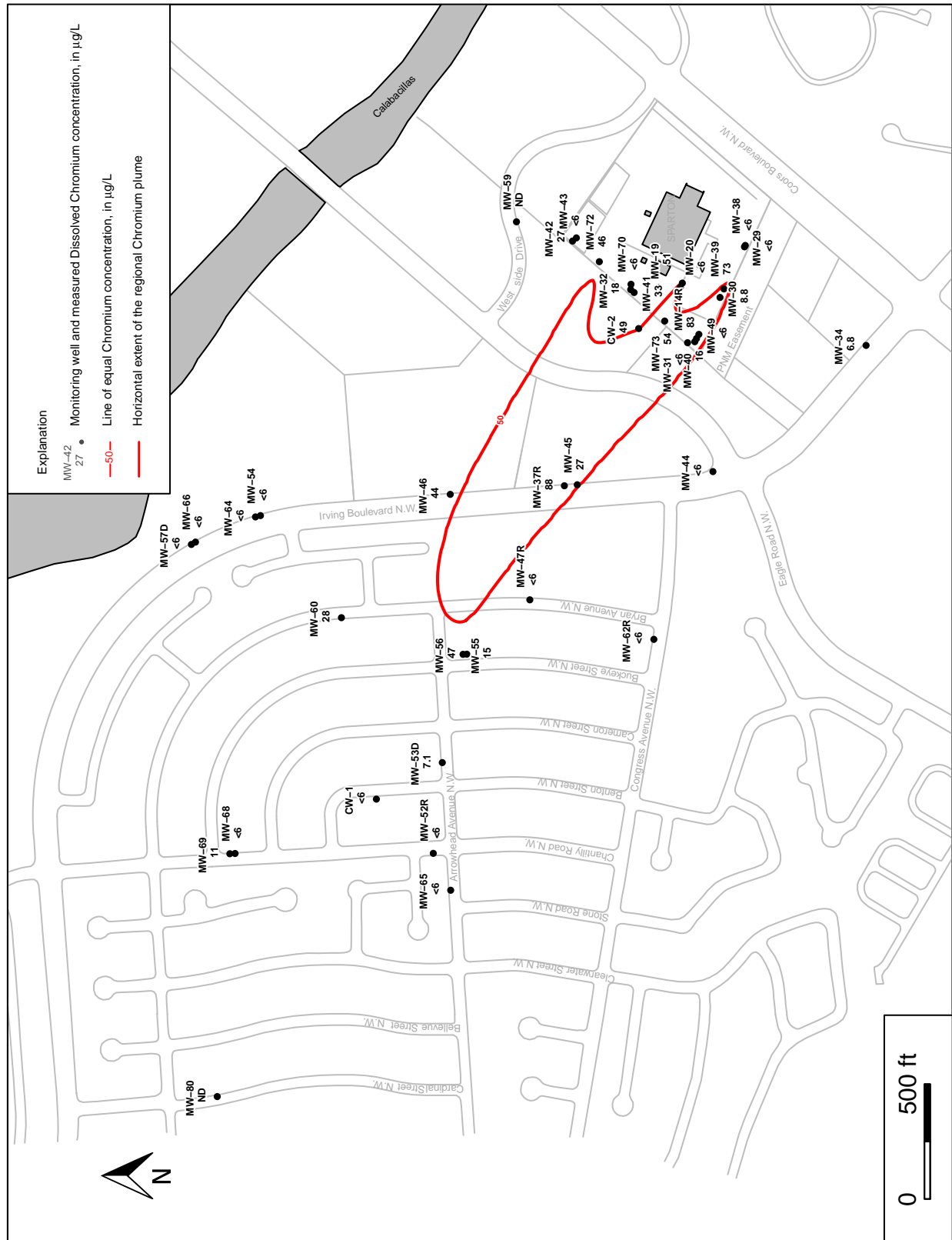


Figure 4.21: Horizontal Extent of the Regional Chromium Plume - November 2019

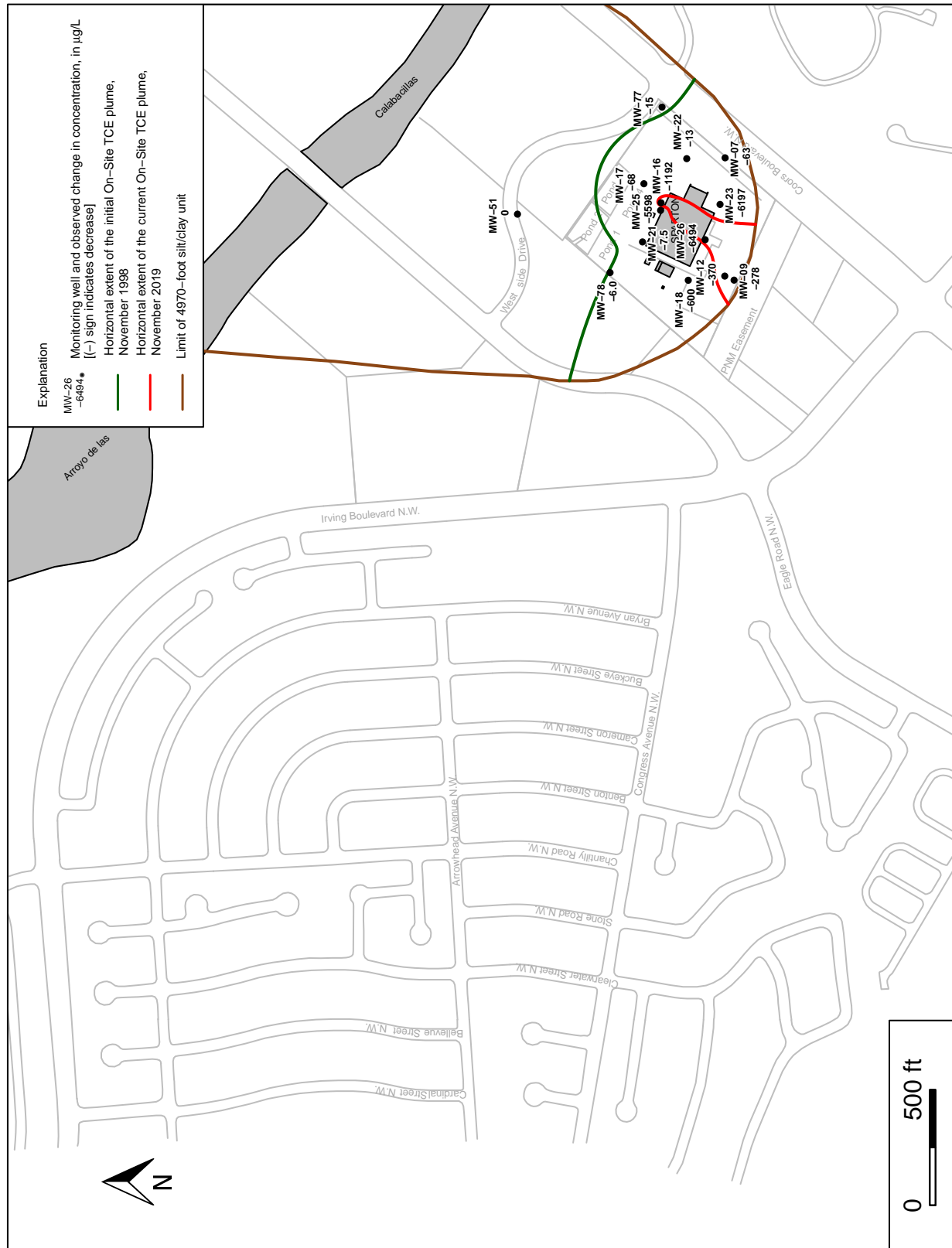


Figure 4.22: Changes in TCE Concentrations at Wells Completed Above the 4970-ft Silt/Clay Unit November 1998 to November 2019

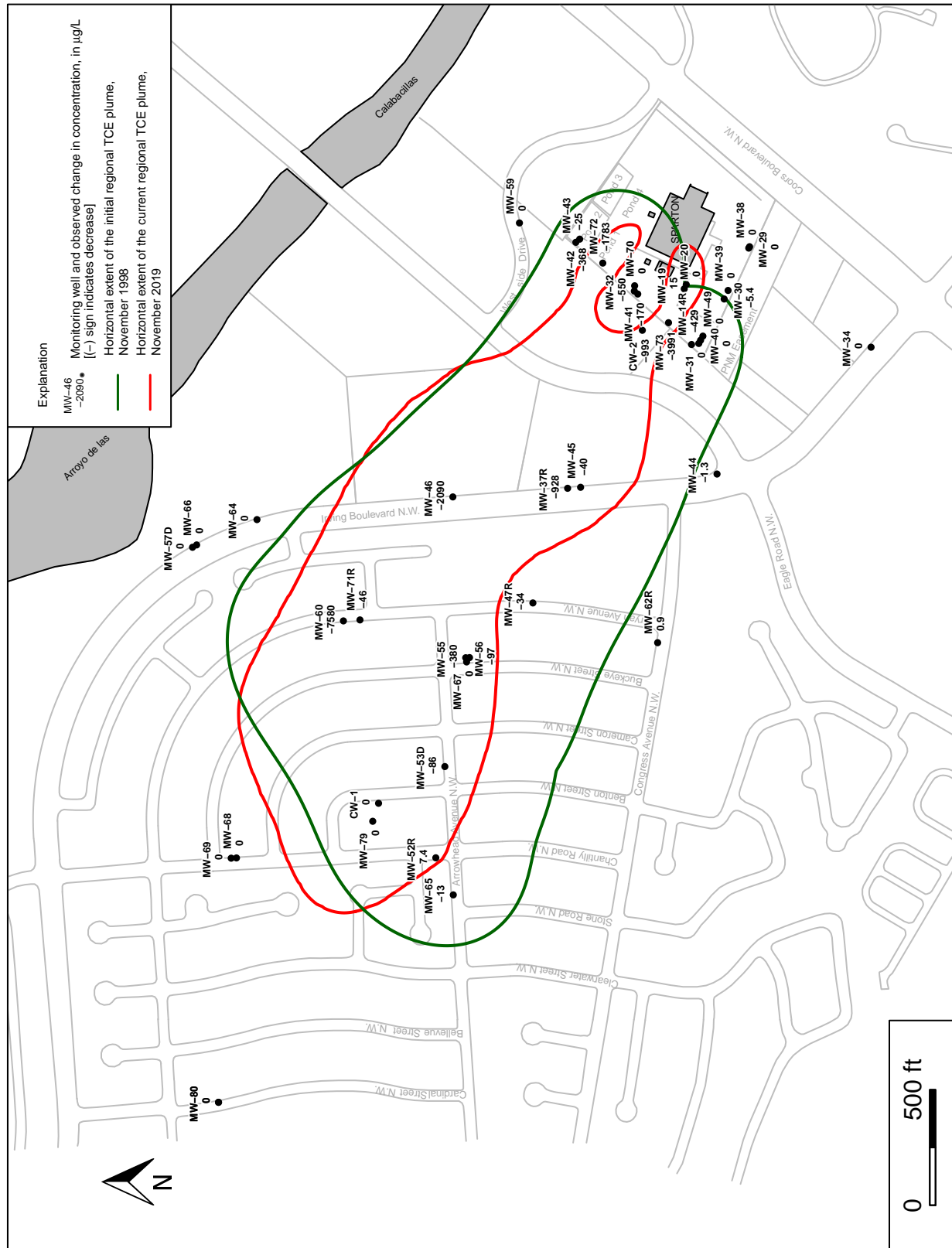


Figure 4.23: Changes in TCE Concentrations at Wells Completed Below the 4970-ft Silt/Clay Unit and in the Off-Site Area November 1998 to November 2019

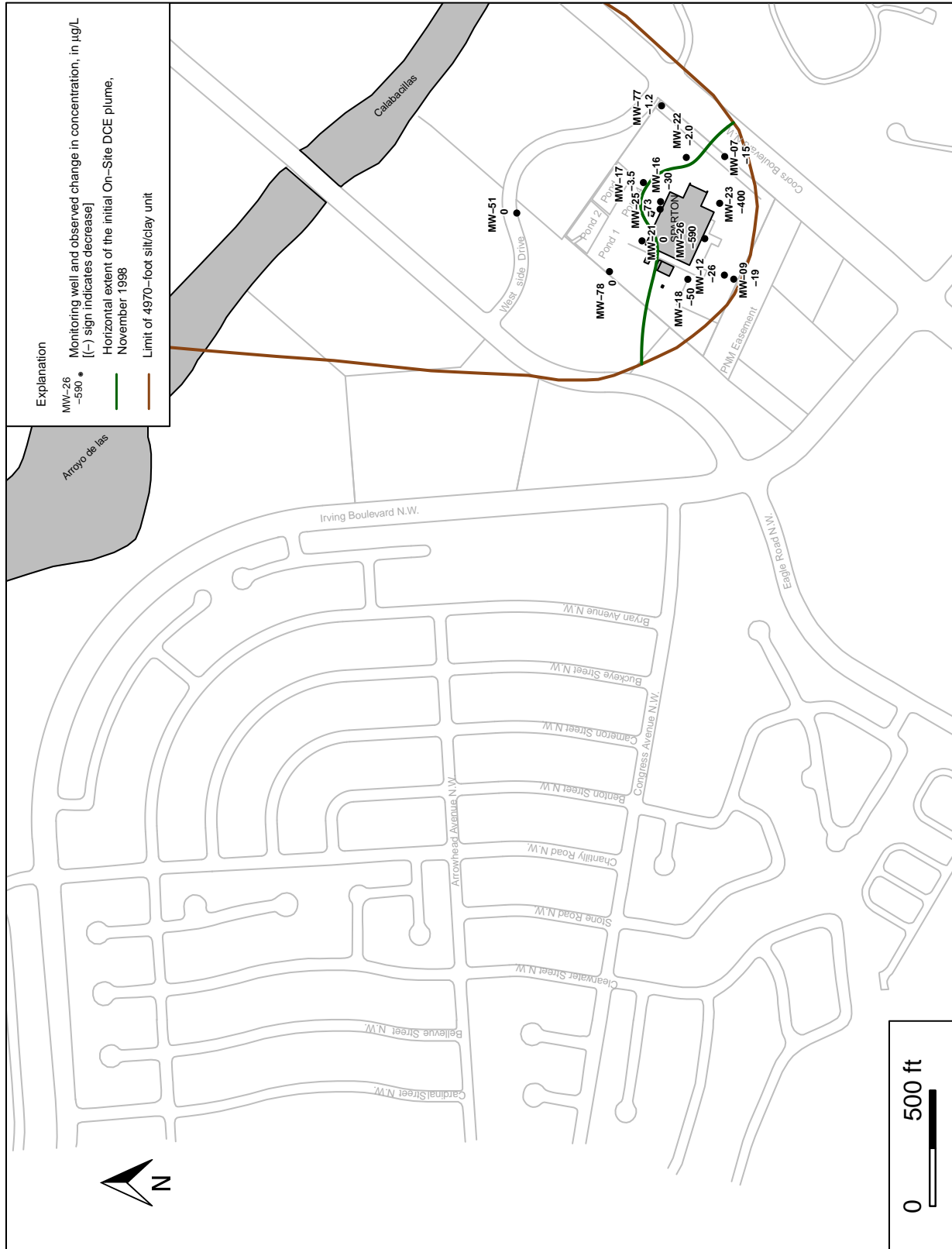


Figure 4.24: Changes in DCE Concentrations at Wells Completed Above the 4970-ft Silt/Clay Unit
November 1998 to November 2019

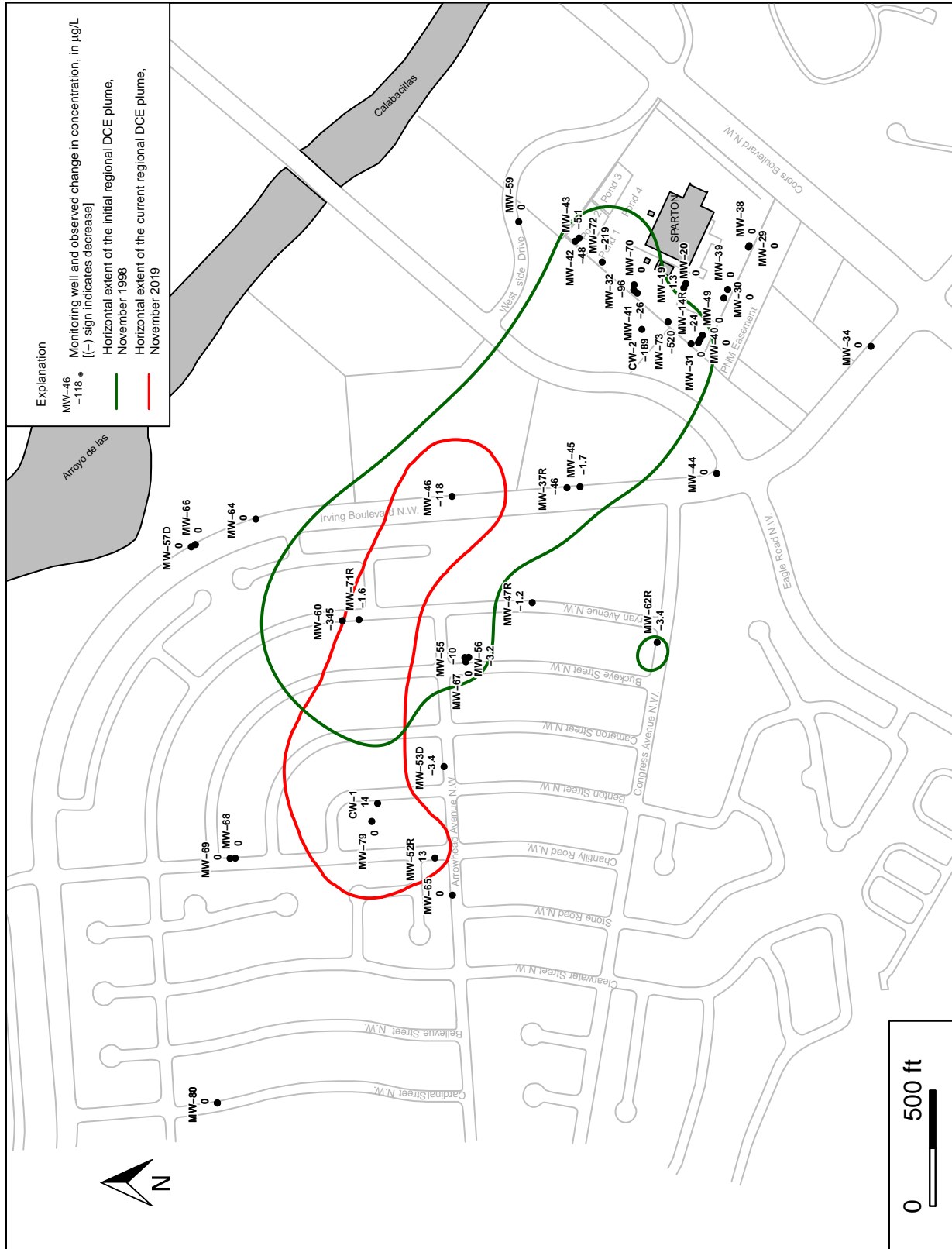


Figure 4.25: Changes in DCE Concentrations at Wells Completed Below the 4970-ft Silt/Clay Unit and in the Off-Site Area November 1998 to November 2019

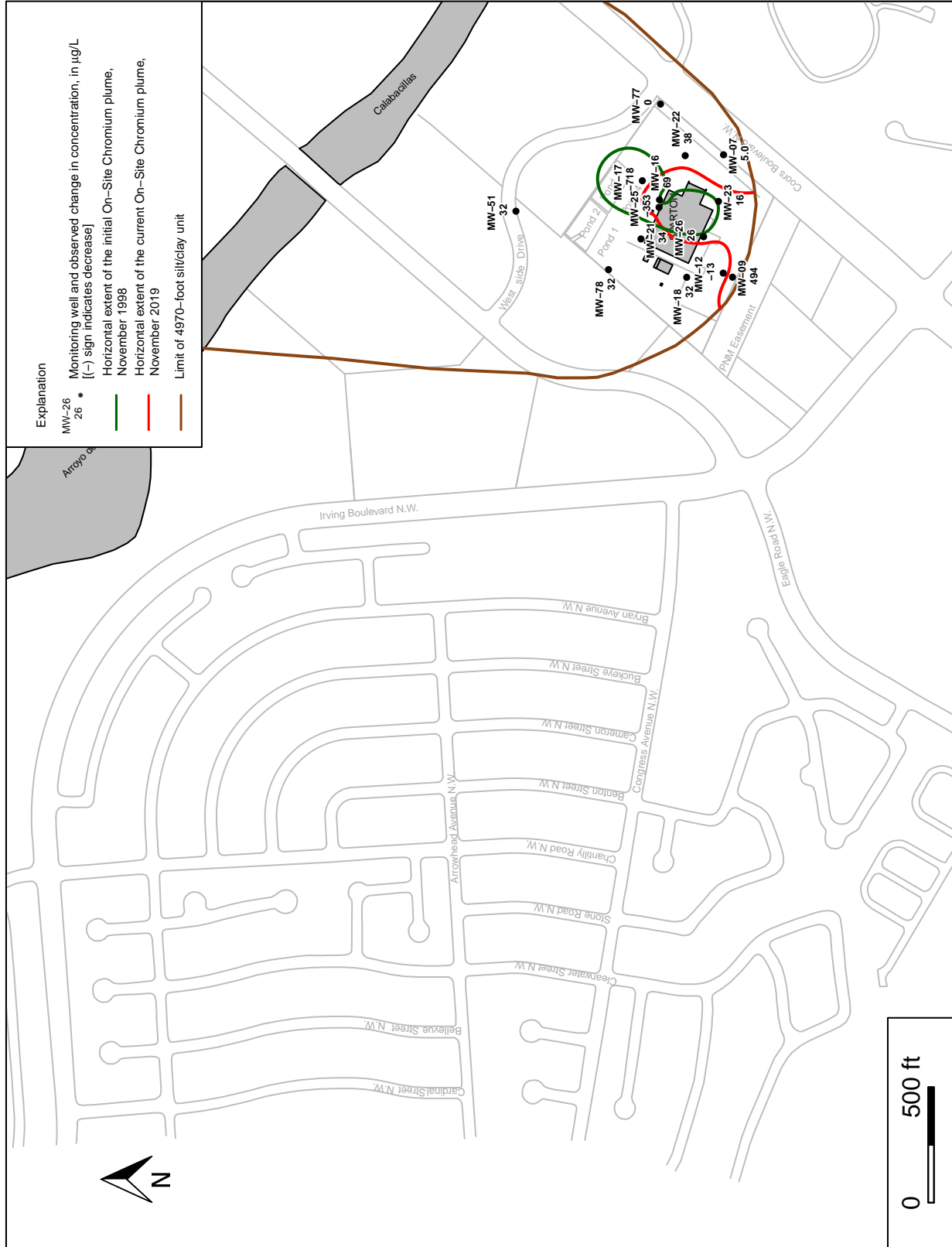


Figure 4.26: Changes in Chromium Concentrations at Wells Completed Above the 4970-ft Silt/Clay Unit November 1998 to November 2019

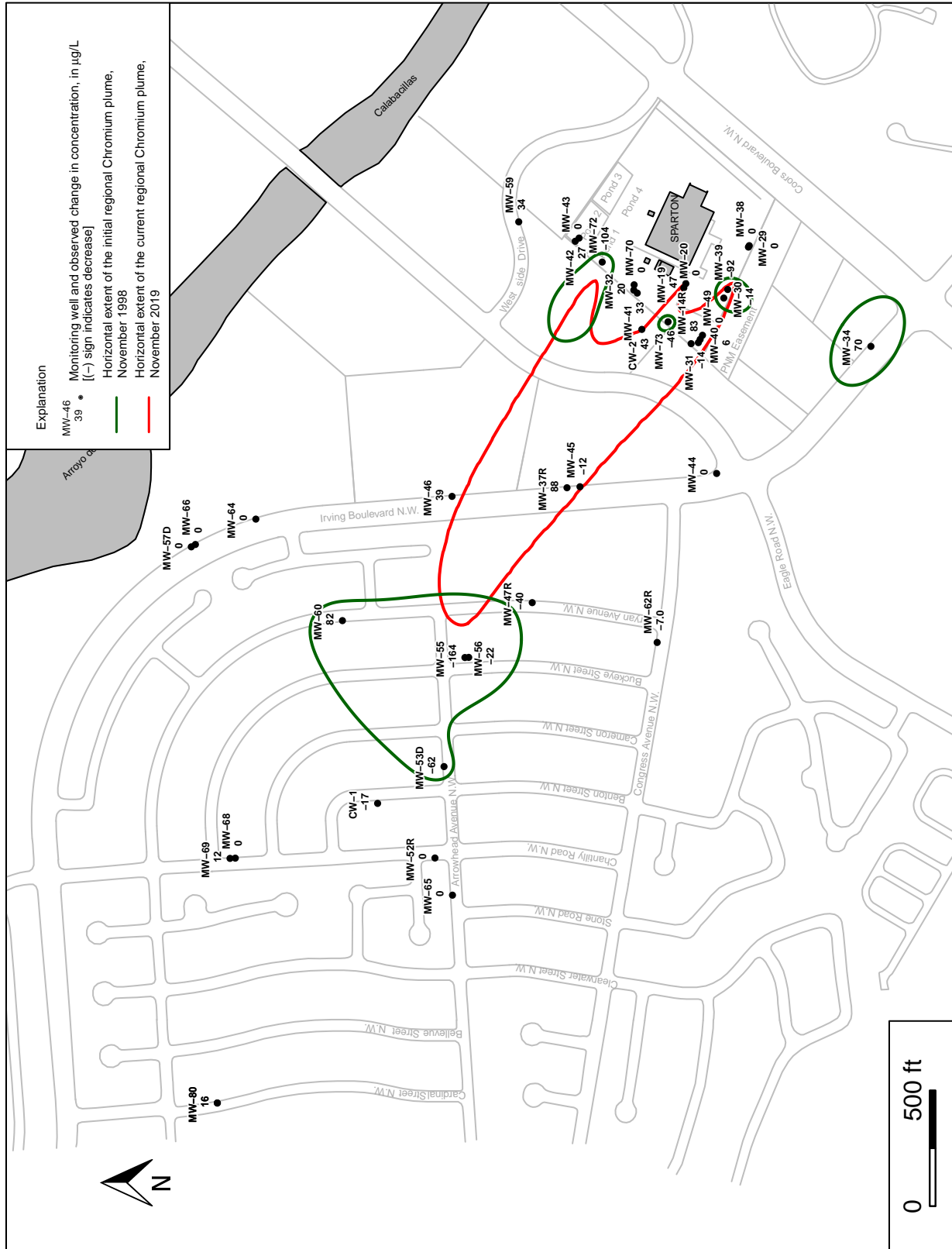


Figure 4.27: Changes in Chromium Concentrations at Wells Completed Below the 4970-ft Silt/Clay Unit and in the Off-Site Area November 1998 to November 2019

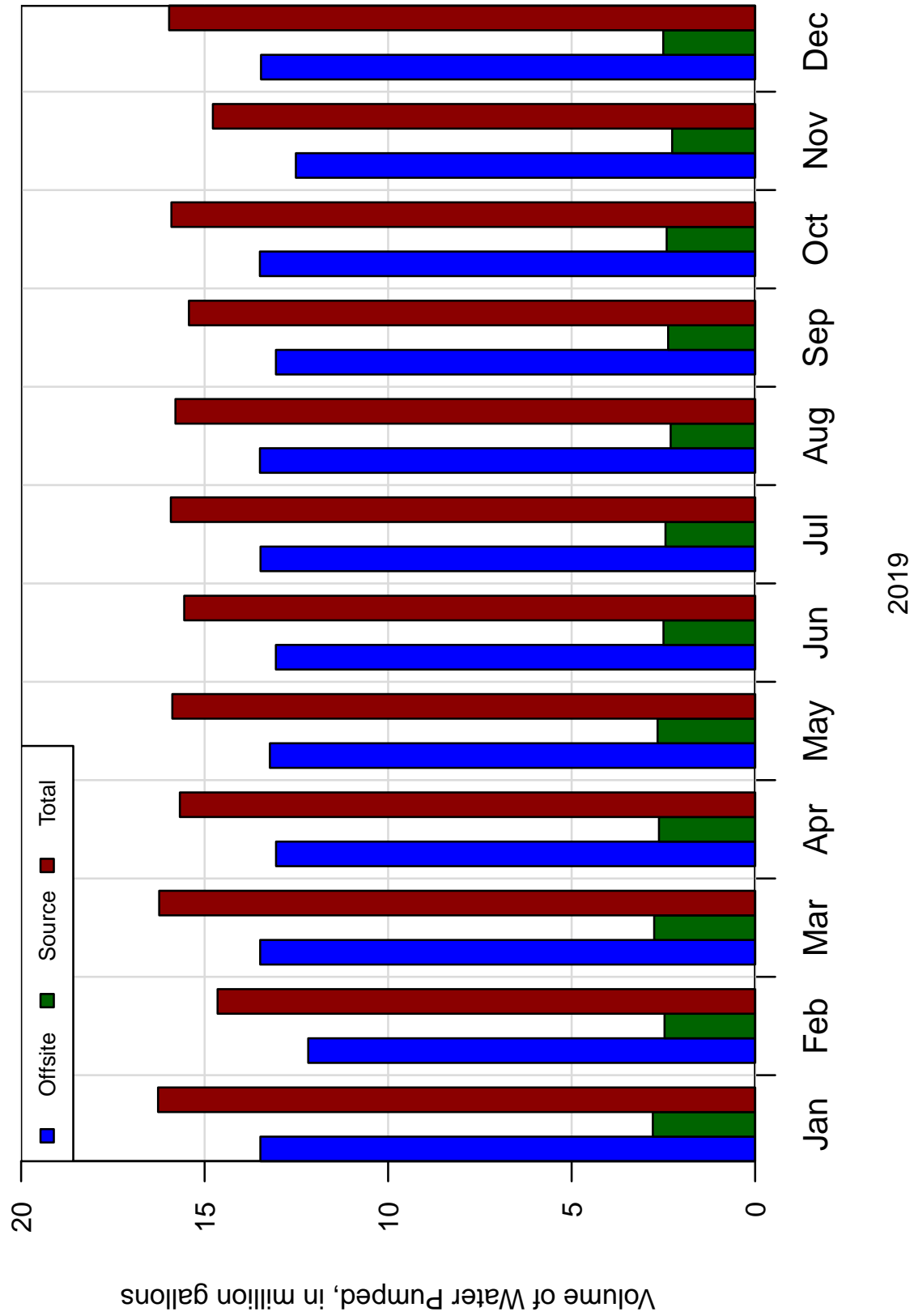
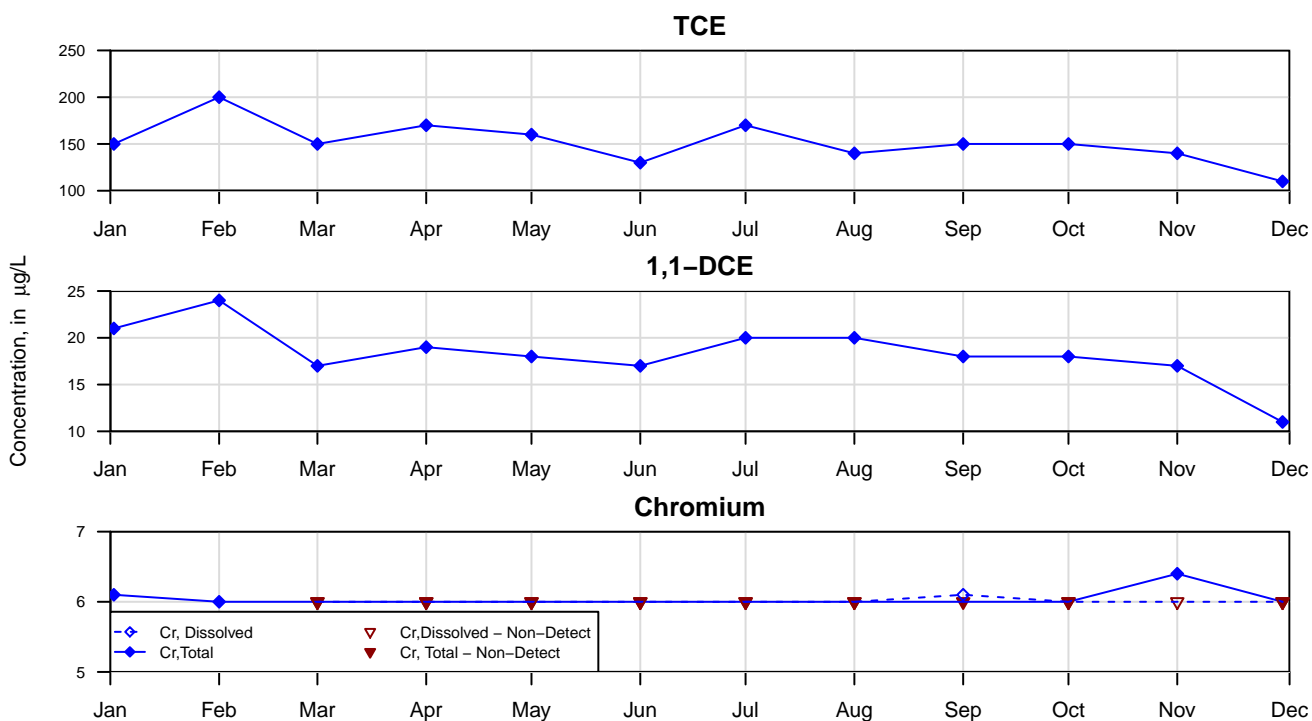


Figure 4.28: Monthly Volume of Water Pumped by the Containment Wells - 2019

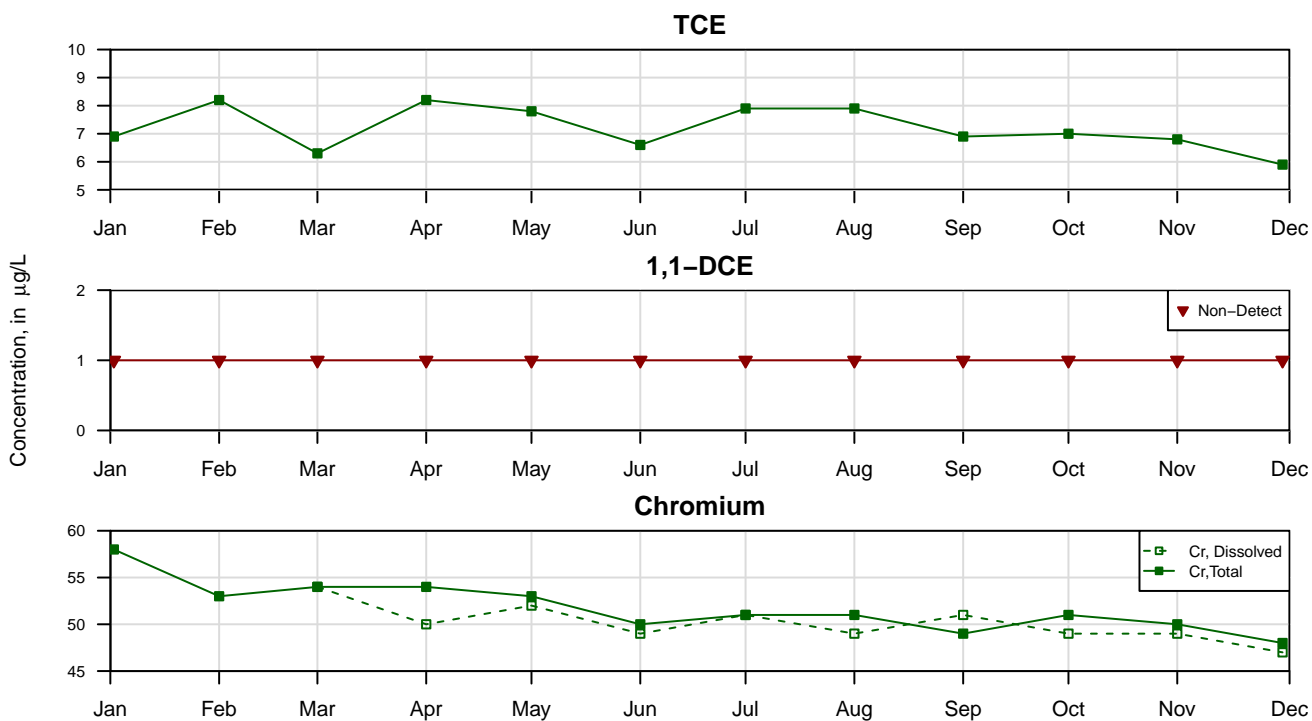


Figure 4.29: Cumulative Volume of Water Pumped by the Containment Wells

(a) Off-Site Containment System



(a) Source Containment System



Note: Non-Detects displayed at Reporting Limit

Figure 4.30: Off-Site and Source Containment Systems - TCE, DCE, and Chromium Concentrations in the Influent - 2019

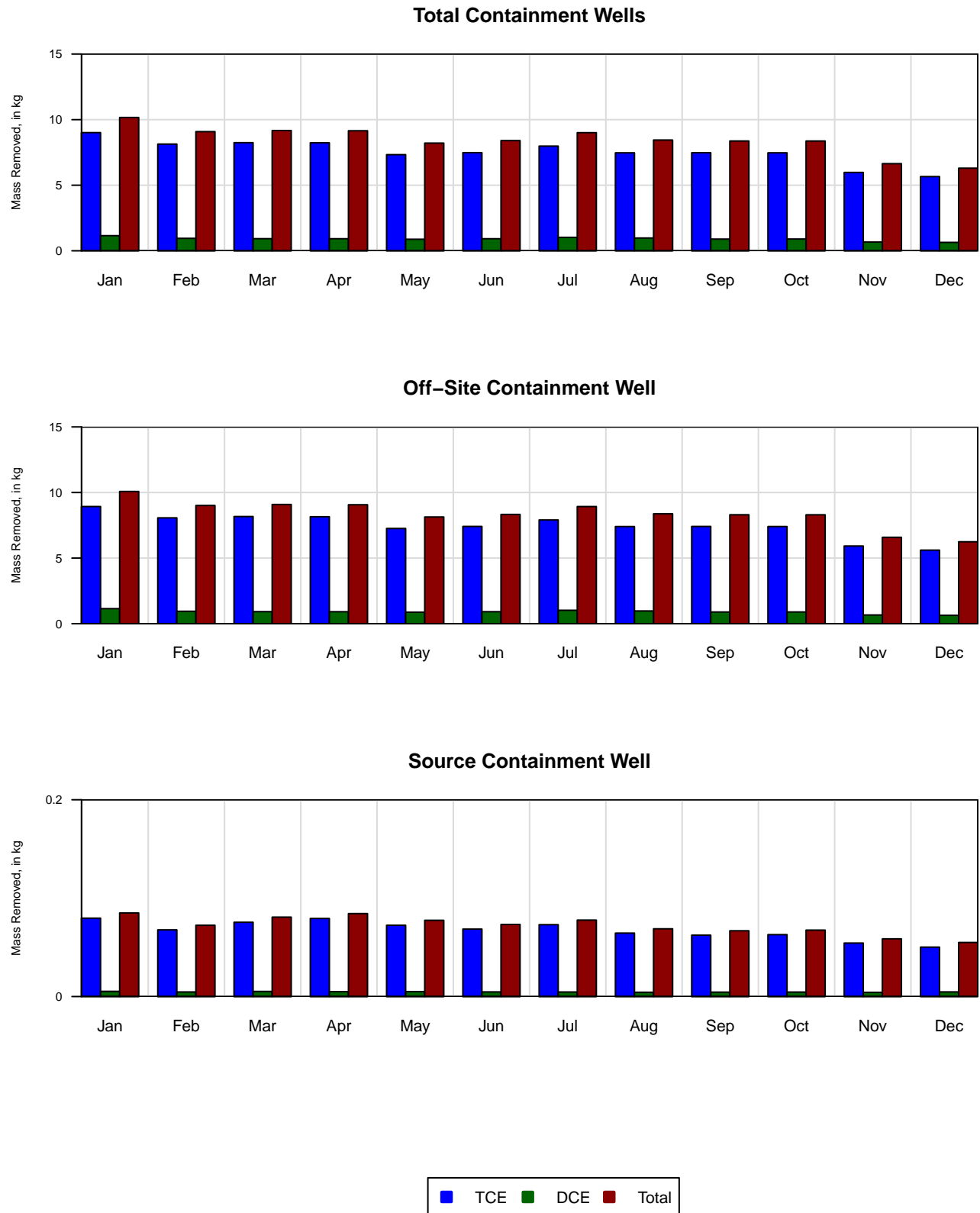


Figure 4.31: Monthly Contaminant Mass Removal by the Containment Wells - 2019

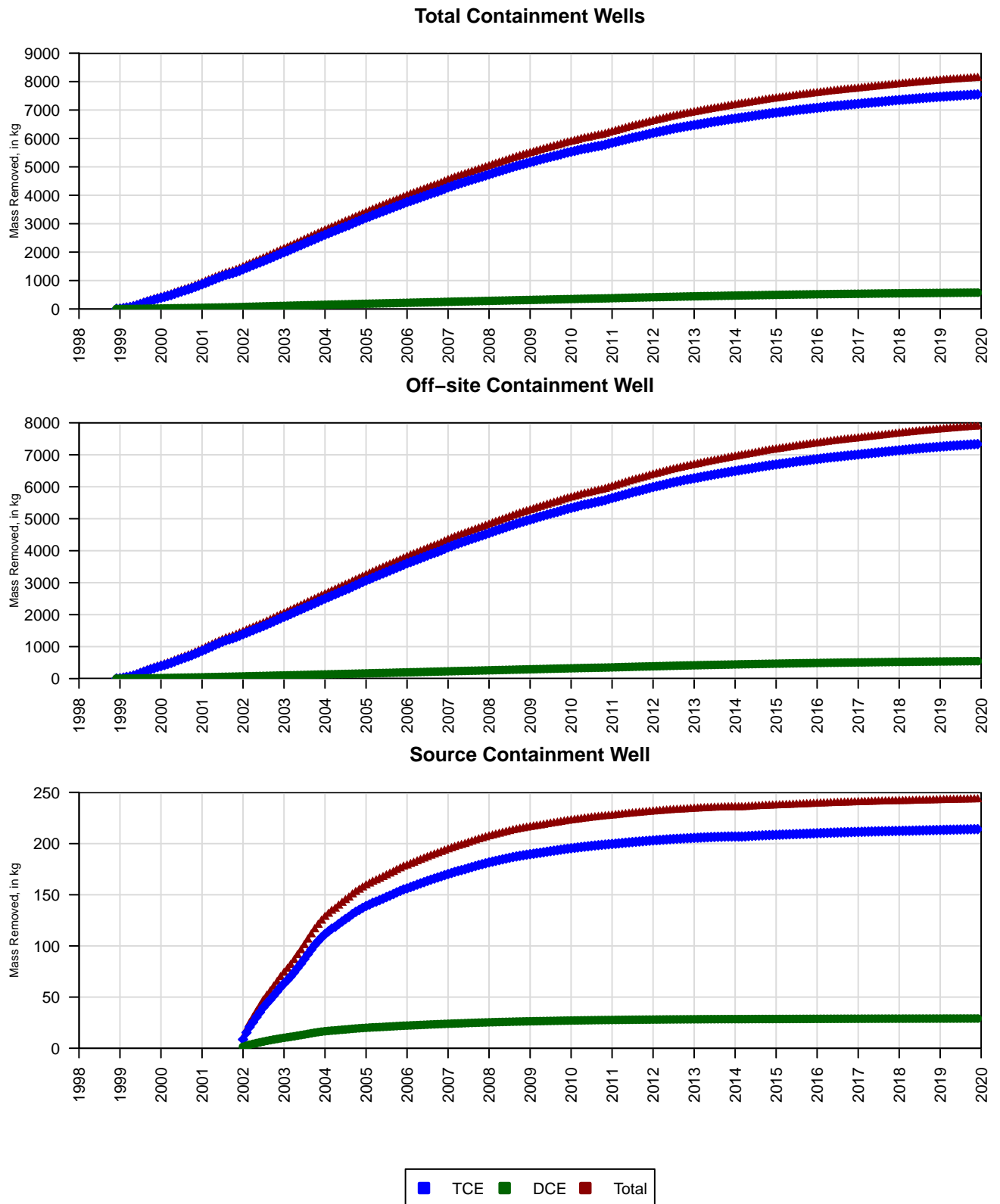


Figure 4.32: Cumulative Contaminant Mass Removal by the Containment Wells

TABLES

Table 2.1: Completion Flow Zone, Location Coordinates, and Measuring Point Elevation of Existing Wells

Well ID	Flow Zone ^a	Easting ^b	Northing ^b	Elevation ^c
CW-1	UFZ/LFZ	374740.43	1525601.48	5168.02
CW-2	UFZ-LLFZ	376788.70	1524459.40	5045.68
MW-07	UFZ	377535.41	1524101.14	5043.48
MW-09	UFZ	377005.75	1524062.25	5042.46
MW-12	UFZ	377023.27	1524102.56	5042.41
MW-14R	UFZ/ULFZ	376727.10	1524246.40	5040.92
MW-16	UFZ	377340.57	1524378.38	5047.50
MW-17	UFZ	377423.18	1524452.68	5046.40
MW-18	UFZ	377005.22	1524260.58	5043.38
MW-19	ULFZ	376986.52	1524269.27	5043.30
MW-20	LLFZ	376967.98	1524277.98	5043.20
MW-21	UFZ	377171.22	1524458.71	5045.78
MW-22	UFZ	377531.77	1524267.24	5044.73
MW-23	UFZ	377333.63	1524123.03	5045.74
MW-24	UFZ	377338.05	1524367.39	5048.70
MW-25	UFZ	377307.91	1524380.40	5046.17
MW-26	UFZ	377180.89	1524187.40	5045.37
MW-27	UFZ	377078.91	1524323.46	5046.04
MW-29	ULFZ	377144.48	1523998.74	5041.88
MW-30	ULFZ	376924.12	1524105.15	5042.12
MW-31	ULFZ	376731.49	1524215.04	5041.38
MW-32	ULFZ	376958.37	1524494.18	5045.29
MW-34	UFZ	376715.25	1523469.17	5034.33
MW-37R	UFZ/ULFZ	376104.50	1524782.90	5093.15
MW-38	LLFZ	377150.52	1523995.17	5041.70
MW-39	LLFZ	376961.13	1524088.17	5042.30
MW-40	LLFZ	376745.33	1524207.40	5041.44
MW-41	ULFZ	376945.67	1524479.28	5044.56
MW-42	ULFZ	377183.28	1524730.69	5057.33
MW-43	LLFZ	377169.66	1524747.27	5057.74
MW-44	ULFZ	376166.14	1524136.09	5058.63
MW-45	ULFZ	376108.80	1524726.75	5089.50
MW-46	ULFZ	376067.09	1525279.84	5118.86
MW-47R	ULFZ	375607.91	1524933.31	5115.17

Well ID	Flow Zone ^a	Easting ^b	Northing ^b	Elevation ^c
MW-49	LLFZ	376763.40	1524197.32	5041.44
MW-51	UFZ	377291.45	1525000.02	5060.34
MW-52R	UFZ/ULFZ	374504.50	1525353.60	5156.37
MW-53D	UFZ/ULFZ	374899.50	1525314.41	5148.62
MW-54	UFZ	375974.55	1526106.27	5097.69
MW-55	LLFZ	375370.70	1525224.15	5143.45
MW-56	ULFZ	375371.31	1525207.68	5141.45
MW-57D	UFZ/ULFZ	375849.02	1526406.98	5103.62
MW-59	ULFZ	377253.38	1524991.51	5060.65
MW-60	ULFZ	375530.19	1525753.61	5134.40
MW-62	UFZ	375421.24	1524395.94	5073.69
MW-62R ^d	UFZ/ULFZ	375435.87	1524393.17	5073.35
MW-63	ULFZ	376840.50	1525236.52	5063.10
MW-64	ULFZ	375968.81	1526127.81	5097.84
MW-65	LLFZ	374343.87	1525277.92	5156.45
MW-66	LLFZ	375859.24	1526389.09	5103.19
MW-67	DFZ	375352.47	1525220.38	5142.21
MW-68	UFZ	374503.81	1526216.71	5168.54
MW-69	LLFZ	374502.80	1526239.55	5167.79
MW-70	LLFZ	376981.33	1524492.75	5046.74
MW-71R	DFZ	375534.49	1525681.93	5134.12
MW-72	ULFZ	377079.68	1524630.73	5056.25
MW-73	ULFZ	376821.45	1524346.08	5051.08
MW-74	UFZ/ULFZ	374484.30	1527810.76	5094.80
MW-75	UFZ/ULFZ	374613.33	1528009.97	5113.74
MW-76	UFZ/ULFZ	375150.41	1527826.10	5108.32
MW-77	UFZ/ULFZ	377754.90	1524374.20	5045.64
MW-78	UFZ/ULFZ	377038.50	1524599.30	5052.91
MW-79	DFZ	374662.64	1525626.72	5168.50
MW-80	ULFZ/LLFZ	373445.75	1526294.35	5203.31
OB-1	UFZ/LFZ	374665.16	1525599.52	5169.10
OB-2	UFZ/LFZ	374537.98	1525606.65	5165.22
PZ-1	UFZ	372283.60	1523143.31	5147.36
PZG-1	Infill. Gall.	374871.44	1527608.15	5090.90

^b New Mexico "Modified State Plane" coordinates, in feet.^c In feet above Mean Sea Level (ft MSL).^d Installed February 11-15, 2019 as a replacement for well MW-62, which was plugged and abandoned at the same time.^a UFZ denotes the Upper Flow Zone; ULFZ and LLFZ denote the upper

and lower, intervals of the Lower Flow Zone (LFZ); DFZ denotes a deeper flow zone separated from the Lower Flow Zone by a continuous clay layer that causes significant head differences between LFZ and DFZ.

Table 2.2: Well Screen Data

Well ID ^a	Flow Zone	Nominal Diameter (in)	Elevation (ft above MSL)			Depth below Ground Surface (ft)		Screen Length (ft)
			Ground Surface	Top of Screen	Bottom of Screen	Top of Screen	Bottom of Screen	
CW-1	UFZ/LFZ	8	5166.4	4957.5	4797.5	208.9	368.9	160.0
CW-2	UFZ-LLFZ	4	5048.5	4968.5	4918.5	80.0	130.0	50.0
MW-07	UFZ	2	5043.0	4979.7	4974.7	63.3	68.3	5.0
MW-09	UFZ	2	5042.4	4975.8	4970.8	66.6	71.6	5.0
MW-12	UFZ	4	5042.3	4978.2	4966.2	64.1	76.1	12.0
MW-14R	UFZ/ULFZ	2	5040.8	4980.5	4950.5	60.3	90.3	30.0
MW-16	UFZ	2	5046.2	4979.7	4974.7	66.5	71.5	5.0
MW-17	UFZ	2	5047.5	4982.3	4977.3	65.2	70.2	5.0
MW-18	UFZ	4	5042.9	4976.0	4966.0	66.9	76.9	10.0
MW-19	ULFZ	4	5042.8	4944.8	4934.8	98.0	108.0	10.0
MW-20	LLFZ	4	5042.8	4919.2	4906.8	123.5	135.9	12.4
MW-21	UFZ	2	5045.7	4982.8	4977.8	62.9	67.9	5.0
MW-22	UFZ	2	5044.6	4977.2	4972.2	67.4	72.4	5.0
MW-23	UFZ	4	5045.6	4973.8	4968.8	71.8	76.8	5.0
MW-24	UFZ	4	5046.2	4977.5	4972.5	68.7	73.7	5.0
MW-25	UFZ	4	5046.1	4977.9	4972.9	68.2	73.2	5.0
MW-26	UFZ	2	5045.4	4969.1	4964.1	76.3	81.3	5.0
MW-27	UFZ	2	5045.8	4975.4	4970.4	70.4	75.4	5.0
MW-29	ULFZ	4	5041.9	4938.3	4928.3	103.6	113.6	10.0
MW-30	ULFZ	4	5041.7	4944.8	4934.8	96.9	106.9	10.0
MW-31	ULFZ	4	5040.9	4945.2	4935.2	95.7	105.7	10.0
MW-32	ULFZ	4	5044.8	4937.3	4927.3	107.5	117.5	10.0
MW-34	UFZ	2	5034.4	4978.0	4968.0	56.4	66.4	10.0
MW-37R	UFZ/ULFZ	2	5093.0	4976.6	4946.6	116.4	146.4	30.0
MW-38	LLFZ	4	5041.6	4915.0	4905.0	126.6	136.6	10.0
MW-39	LLFZ	4	5042.2	4918.7	4908.7	123.5	133.5	10.0
MW-40	LLFZ	4	5040.0	4923.9	4913.9	116.1	126.1	10.0
MW-41	ULFZ	4	5044.1	4952.1	4942.1	92.0	102.0	10.0
MW-42	ULFZ	4	5054.8	4949.3	4939.3	105.5	115.5	10.0
MW-43	LLFZ	4	5055.2	4927.7	4917.7	127.5	137.5	10.0
MW-44	ULFZ	4	5058.8	4952.4	4942.4	106.4	116.4	10.0
MW-45	ULFZ	4	5090.1	4948.5	4938.5	141.6	151.6	10.0
MW-46	ULFZ	4	5118.5	4949.4	4939.4	169.1	179.1	10.0
MW-47R	ULFZ	4	5115.2	4955.2	4935.2	160.0	180.0	20.0
MW-49	LLFZ	4	5041.0	4903.2	4893.2	137.8	147.8	10.0
MW-51	UFZ	2	5059.9	4984.5	4974.5	75.4	85.4	10.0
MW-52R	UFZ/ULFZ	4	5156.2	4969.2	4939.2	187.0	217.0	30.0
MW-53D	UFZ/ULFZ	2	5148.6	4963.6	4943.6	185.0	205.0	20.0
MW-54	UFZ	4	5097.2	4976.8	4961.8	120.4	135.4	15.0
MW-55	LLFZ	4	5143.1	4913.1	4903.1	230.0	240.0	10.0
MW-56	ULFZ	4	5141.0	4942.9	4932.9	198.1	208.1	10.0
MW-57D	UFZ/ULFZ	4	5103.1	4958.1	4938.1	145.0	165.0	20.0
MW-59	ULFZ	4	5060.2	4954.9	4944.4	105.3	115.8	10.5
MW-60	ULFZ	4	5134.4	4949.5	4939.5	184.9	194.9	10.0
MW-62	UFZ	2	5073.7	4975.1	4960.1	98.6	113.6	15.0
MW-62R	UFZ/ULFZ	2	5073.3	4967.3	4952.3	106.0	121.0	15.0
MW-63	ULFZ	2	5063.1	4983.1	4968.1	80.0	95.0	15.0

Table 2.2 (cont.): Well Screen Data

Well ID ^a	Flow Zone	Nominal Diameter (in)	Elevation (ft above MSL)			Depth below Ground Surface (ft)		Screen Length (ft)
			Ground Surface	Top of Screen	Bottom of Screen	Top of Screen	Bottom of Screen	
MW-64	ULFZ	4	5097.4	4959.3	4949.1	138.1	148.3	10.2
MW-65	LLFZ	4	5156.4	4896.4	4886.4	260.1	270.1	10.0
MW-66	LLFZ	4	5102.6	4903.3	4893.3	199.3	209.3	10.0
MW-67	DFZ	4	5142.2	4798.1	4788.1	344.1	354.1	10.0
MW-68	UFZ	4	5168.5	4970.5	4950.5	198.0	218.0	20.0
MW-69	LLFZ	4	5167.8	4904.7	4894.7	263.1	273.1	10.0
MW-70	LLFZ	2	5046.3	4912.1	4902.1	134.2	144.2	10.0
MW-71R	DFZ	4	5134.2	4761.5	4756.5	372.7	377.7	5.0
MW-72	ULFZ	2	5053.7	4955.0	4945.0	98.7	108.7	10.0
MW-73	ULFZ	2	5050.6	4945.5	4940.5	105.1	110.1	5.0
MW-74	UFZ/ULFZ	2	5092.4	4969.2	4939.2	123.2	153.2	30.0
MW-75	UFZ/ULFZ	2	5111.6	4971.2	4941.2	140.4	170.4	30.0
MW-76	UFZ/ULFZ	2	5105.5	4972.4	4942.4	133.1	163.1	30.0
MW-77	UFZ/ULFZ	2	5045.5	4985.8	4955.8	59.6	89.6	30.0
MW-78	UFZ/ULFZ	2	5050.5	4988.1	4958.1	62.4	92.4	30.0
MW-79	DFZ	6	5166.7	4767.7	4752.7	399.0	414.0	15.0
MW-79	DFZ	6	5166.7	4747.7	4732.7	419.0	434.0	15.0
MW-80	ULFZ/LLFZ	4	5203.3	4934.3	4894.3	269.0	309.0	40.0
OB-1	UFZ/LFZ	4	5166.2	4960.3	4789.8	205.9	376.4	170.0
OB-2	UFZ/LFZ	4	5164.8	4960.3	4789.7	204.5	375.1	171.0
PZ-1	UFZ	2	5141.3	4961.5	4951.3	179.8	190.0	10.2

a The letter R after the number in the Well ID indicates that the well is a new and deeper replacement well installed near the original well location; the letter D after the number in the Well ID indicates that the well has been deepened.

Table 2.3: Sampling Frequency and Method for Monitoring Wells

Well ID	Flow Zone	Sampling Method	Pump Intake	Sampling Frequency
MW-07	UFZ	Bailer		Annual
MW-09	UFZ	Bailer		Annual
MW-12	UFZ	Bailer		Annual
MW-14R	UFZ/ULFZ	Bladder Pump	1-ft from bottom of screen	Annual
MW-16	UFZ	Bailer		Annual
MW-17	UFZ	Bailer		Quarterly
MW-18	UFZ	Bailer		Annual
MW-19	ULFZ	Bladder (Sampling) Pneumatic Displacement Pump (Purging)	1-ft from bottom of screen	Annual
MW-20	LLFZ	Bladder (Sampling) Pneumatic Displacement Pump (Purging)	1-ft from bottom of screen	Annual
MW-21	UFZ	Bailer		Annual
MW-22	UFZ	Bladder Pump	1-ft from bottom of screen	Annual
MW-23	UFZ	Bailer		Annual
MW-25	UFZ	Bailer		Annual
MW-26	UFZ	Bailer		Annual
MW-29	ULFZ	Bladder Pump	1-ft from bottom of screen	Annual
MW-30	ULFZ	Bladder Pump	1-ft from bottom of screen	Annual
MW-31	ULFZ	Bladder Pump	1-ft from bottom of screen	Annual
MW-32	ULFZ	Bladder (Sampling) Pneumatic Displacement Pump (Purging)	1-ft from bottom of screen	Annual
MW-34	UFZ	Bailer		Annual
MW-37R	UFZ/ULFZ	Bladder Pump	1-ft from bottom of screen	Annual
MW-38	LLFZ	Bladder (Sampling) Pneumatic Displacement Pump (Purging)	1-ft from bottom of screen	Annual
MW-39	LLFZ	Bladder (Sampling) Pneumatic Displacement Pump (Purging)	1-ft from bottom of screen	Annual
MW-40	LLFZ	Bladder (Sampling) Pneumatic Displacement Pump (Purging)	1-ft from bottom of screen	Annual
MW-41	ULFZ	Bladder (Sampling) Pneumatic Displacement Pump (Purging)	1-ft from bottom of screen	Annual
MW-42	ULFZ	Bladder (Sampling) Pneumatic Displacement Pump (Purging)	1-ft from bottom of screen	Annual
MW-43	LLFZ	Bladder (Sampling) Pneumatic Displacement Pump (Purging)	1-ft from bottom of screen	Annual
MW-44	ULFZ	Bladder (Sampling) Pneumatic Displacement Pump (Purging)	1-ft from bottom of screen	Annual
MW-45	ULFZ	Bladder (Sampling) Pneumatic Displacement Pump (Purging)	1-ft from bottom of screen	Annual
MW-46	ULFZ	Bladder (Sampling) Pneumatic Displacement Pump (Purging)	1-ft from bottom of screen	Annual
MW-47R	ULFZ	Bladder Pump	1-ft from bottom of screen	Annual
MW-49	LLFZ	Bladder (Sampling) Pneumatic Displacement Pump (Purging)	1-ft from bottom of screen	Annual
MW-51	UFZ	Bladder Pump	1-ft from bottom of screen	Annual
MW-52R	UFZ/ULFZ	Bladder Pump	1-ft from bottom of screen	Quarterly
MW-53D	UFZ/ULFZ	Bladder Pump	1-ft from bottom of screen	Annual
MW-55	LLFZ	Packer/Bladder Pump ^a	Center of screen	Annual
MW-56	ULFZ	Packer/Bladder Pump ^a	Center of screen	Annual

Table 2.3 (cont.): Sampling Frequency and Method for Monitoring Wells

Well ID	Flow Zone	Sampling Method	Pump Intake	Sampling Frequency
MW-57D	UFZ/ULFZ	Bladder Pump	1-ft from bottom of screen	Quarterly
MW-59	ULFZ	Bladder (Sampling) Pneumatic Displacement Pump (Purging)	1-ft from bottom of screen	Annual
MW-60	ULFZ	Bladder (Sampling) Pneumatic Displacement Pump (Purging)	1-ft from bottom of screen	Annual
MW-62R	UFZ/ULFZ	Bladder Pump	1-ft from bottom of screen	Quarterly
MW-64	ULFZ	Bladder (Sampling) Pneumatic Displacement Pump (Purging)	1-ft from bottom of screen	Annual
MW-65	LLFZ	Packer/Bladder Pump ^a	Center of screen	Quarterly
MW-66	LLFZ	Packer/Bladder Pump ^a	Center of screen	Quarterly
MW-67	DFZ	Packer/Bladder Pump ^a	Center of screen	Semi-annual
MW-68	UFZ	Bladder Pump	Center of screen	Quarterly
MW-69	LLFZ	Packer/Bladder Pump ^a	Center of screen	Quarterly
MW-70	LLFZ	Packer/Bladder Pump ^a	Center of screen	Annual
MW-71R	DFZ	Packer/Bladder Pump ^a	Center of screen	Quarterly
MW-72	ULFZ	Bladder Pump	1-ft from bottom of screen	Annual
MW-73	ULFZ	Bladder Pump	1-ft from bottom of screen	Annual
MW-74	UFZ/ULFZ	Bladder Pump	1-ft from bottom of screen	Quarterly
MW-75	UFZ/ULFZ	Bladder Pump	1-ft from bottom of screen	Quarterly
MW-76	UFZ/ULFZ	Bladder Pump	1-ft from bottom of screen	Quarterly
MW-77	UFZ/ULFZ	Bladder Pump	1-ft from bottom of screen	Quarterly
MW-78	UFZ/ULFZ	Bladder Pump	1-ft from bottom of screen	Quarterly
MW-79	DFZ	Submersible Pump ^b	1-ft from bottom of screen	Semi-annual
MW-80	ULFZ/LLFZ	Submersible Pump ^c	1-ft from bottom of screen	Quarterly

a Screened interval isolated with packer above the top of the screen

b Hardwired to power from treatment building

c Powered by portable generator

Table 2.4: Operation and Downtime of the Off-Site Containment System - 2019

(a) Operation

Available Hours	8,760 hrs
Total Operating Hours	8,713 hrs
Percent of Operating to Available Hours	99.47%
Total Downtime Hours	46.72 hrs
Range of Downtime Hours	16.2 - 30.52 hrs

(b) Downtime

Date of Downtime				Duration	Cause
From		To			
05/05/2019	14:55	05/06/2019	07:07	16.20 hrs	Air stripper fault
11/28/2019	16:08	11/29/2019	22:39	30.52 hrs	Power outage due to snow storm

Table 2.5: Operation and Downtime of the Source Containment System - 2019
(a) Operation

Available Hours	8,760 hrs
Total Operating Hours	8,710 hrs
Percent of Operating to Available Hours	99.43%
Total Downtime Hours	49.97 hrs
Range of Downtime Hours	0.1 - 30.83 hrs

(b) Downtime

Date of Downtime		Duration	Cause
From	To		
01/03/2019 09:10	01/03/2019 09:16	6 min	Tank Exchange
01/31/2019 09:10	01/31/2019 09:40	30 min	Tank Exchange
02/10/2019 09:00	02/10/2019 19:51	10.85 hrs	Air stripper level control fault
02/28/2019 09:00	02/28/2019 09:17	17 min	Tank Exchange
04/02/2019 10:24	04/02/2019 10:55	31 min	Tank Exchange
05/02/2019 09:02	05/02/2019 09:20	18 min	Tank Exchange
06/06/2019 09:05	06/06/2019 09:22	17 min	Tank Exchange
07/11/2019 08:50	07/11/2019 09:18	28 min	Tank Exchange
08/15/2019 08:40	08/15/2019 09:01	21 min	Tank Exchange
09/03/2019 13:14	09/03/2019 16:14	3.00 hrs	Drainage line cleaning between well head and treatment building
09/19/2019 08:50	09/19/2019 09:19	29 min	Tank Exchange
10/18/2019 14:01	10/18/2019 15:28	1.45 hrs	Replacement of 2-inch ball valves located within the well vault
10/24/2019 09:10	10/24/2019 09:29	19 min	Tank Exchange
11/28/2019 15:09	11/29/2019 21:59	30.83 hrs	Power outage due to snow storm
12/05/2019 09:16	12/05/2019 09:30	14 min	Tank Exchange



Table 3.1: Quarterly Water-Level Elevations - 2019

Well ID	Flow Zone	Elevation (feet above MSL)			
		Feb. 1, 2019	May. 1, 2019	Aug. 1, 2019	Nov. 1, 2019
CW-1	UFZ/LFZ	4915.72	4915.13	4914.76	4914.43
CW-2	UFZ-LLFZ	4948.03	4948.47	4947.73	4953.46
MW-07	UFZ	4974.88	4975.43	4975.58	4975.80
MW-09	UFZ	4970.14	4970.57	4970.84	4970.80
MW-12	UFZ	4969.53	4969.93	4970.21	4970.19
MW-14R	UFZ/ULFZ	4967.49	4967.77	4968.04	4968.06
MW-16	UFZ	4981.52	4981.68	4981.87	4981.91
MW-17	UFZ	4981.06	4981.25	4981.61	4981.57
MW-18	UFZ	4973.07	4974.15	4975.59	4976.45
MW-19	ULFZ	4968.60	4968.95	4969.10	4969.18
MW-20	LLFZ	4968.10	4968.46	4968.62	4968.69
MW-21	UFZ	4982.56	4982.68	4982.66	4982.80
MW-22	UFZ	4976.78	4977.23	4978.00	4977.73
MW-23	UFZ	4973.80	4974.33	4974.76	4974.24
MW-24	UFZ	4981.35	4981.45	4981.65	4981.66
MW-25	UFZ	4981.35	4981.68	4981.82	4981.88
MW-26	UFZ	4971.19	4971.65	4971.94	4971.81
MW-27	UFZ	4977.47	4977.74	4978.07	4978.60
MW-29	ULFZ	4971.76	4972.18	4971.48	4971.48
MW-30	ULFZ	4969.03	4969.42	4969.64	4969.67
MW-31	ULFZ	4967.61	4967.90	4968.15	4968.16
MW-32	ULFZ	4967.54	4967.89	4968.00	4967.93
MW-34	UFZ	4971.08	4971.56	4971.85	4971.78
MW-37R	UFZ/ULFZ	4964.70	4965.00	4965.07	4965.11
MW-38	LLFZ	4970.73	4971.19	4971.41	4971.44
MW-39	LLFZ	4969.34	4969.39	4969.98	4969.99
MW-40	LLFZ	4967.69	4968.04	4968.23	4968.23
MW-41	ULFZ	4967.87	4968.14	4968.37	4968.43
MW-42	ULFZ	4968.35	4968.58	4968.57	4968.79
MW-43	LLFZ	4968.13	4968.37	4968.34	4968.58
MW-44	ULFZ	4966.52	4966.93	4967.15	4967.14
MW-45	ULFZ	4965.12	4966.29	4966.39	4966.48
MW-46	ULFZ	4964.14	4964.33	4964.31	4964.39
MW-47R	ULFZ	4963.06	4963.50	4963.59	4963.61

Well ID	Flow Zone	Elevation (feet above MSL)			
		Feb. 1, 2019	May. 1, 2019	Aug. 1, 2019	Nov. 1, 2019
MW-49	LLFZ	4967.61	4968.22	4968.35	4968.36
MW-51	UFZ	4982.75	4982.66	4982.92	4983.02
MW-52R	UFZ/ULFZ	4957.96	4958.07	4958.04	4958.02
MW-53D	UFZ/ULFZ	4960.77	4960.99	4961.16	4961.04
MW-54	UFZ	4963.76	4964.02	4963.99	4963.91
MW-55	LLFZ	4961.21	4961.17	4961.26	4961.33
MW-56	ULFZ	4962.63	4962.73	4962.49	4962.14
MW-57D	UFZ/ULFZ	4963.33	4963.52	4963.40	4963.61
MW-59	ULFZ	4967.62	4967.67	4967.54	4967.74
MW-60	ULFZ	4962.64	4962.71	4962.69	4962.78
MW-62R	UFZ/ULFZ		4966.68	4966.79	4966.91
MW-63	ULFZ	4976.85	4975.58	4976.80	4977.92
MW-64	ULFZ	4963.39	4963.58	4963.50	4963.63
MW-65	LLFZ	4958.15	4958.31	4958.25	4957.93
MW-66	LLFZ	4961.94	4962.19	4961.93	4962.23
MW-67	DFZ	4957.07	4956.86	4956.25	4956.63
MW-68	ULFZ	4958.19	4958.79	4958.73	4958.71
MW-69	LLFZ	4958.47	4958.65	4958.52	4958.58
MW-70	LLFZ	4967.17	4967.46	4967.51	4967.65
MW-71R	DFZ	4957.25	4956.92	4956.26	4956.99
MW-72	ULFZ	4968.32	4968.55	4968.61	4968.78
MW-73	ULFZ	4966.97	4967.30	4967.46	4967.40
MW-74	UFZ/ULFZ	4963.00	4963.14	4962.81	4963.09
MW-75	UFZ/ULFZ	4968.24	4968.39	4968.14	4968.19
MW-76	UFZ/ULFZ	4969.42	4969.60	4969.41	4969.64
MW-77	UFZ/ULFZ	4976.29	4976.94	4977.46	4977.21
MW-78	UFZ/ULFZ	4974.79	4974.91	4975.08	4975.39
MW-79	DFZ	4954.48	4954.08	4952.54	4954.96
MW-80	ULFZ/LLFZ	4957.01	4957.10	4956.86	4956.90
OB-1	UFZ/LFZ	4953.67	4954.66	4954.54	4954.72
OB-2	UFZ/LFZ	4956.06	4956.13	4956.06	4956.09
PZ-1	UFZ	4955.42	4955.65	4955.36	4955.43
PZG-1	Infilt. Gall.	5067.88	5067.92	5067.82	5067.87

Measured water level is below the bottom of screen but within a 5-foot blank casing, connected to the aquifer

Table 3.2: Water-Quality Data from Groundwater Monitoring Program Wells - 2019

Well ID	Sample Date	TCE μg/L	1,1-DCE μg/L	1,1,1-TCA μg/L	Chromium		Additional Compounds ^a
					Total μg/L	Dissolved μg/L	
MW-07	11/03/2019	<1	<1	<1	58	19	
MW-09	11/03/2019	12	<1	<1	510	500	Chloroform: 2.8
MW-12	11/03/2019	9.9	<1	<1	11	7.3	
MW-14R	11/05/2019	1.1	<1	<1	91	83	Bromodichloromethane: 3.7 Chloroform: 5.9
MW-16	11/02/2019	8.5	<1	<1	450	140	
MW-18	11/02/2019	<1	<1	<1	34	32	
MW-19	11/07/2019	19	1.3	<1	47	51	
MW-20	11/07/2019	<1	<1	<1	<6	<6	
MW-20	11/07/2019-DUP	<1	<1	<1	<6	<6	
MW-21	11/08/2019	<1	<1	<1	120	34	
MW-22	11/04/2019	<1	<1	<1	38	36	
MW-23	11/03/2019	3.1	<1	<1	110	64	
MW-25	11/08/2019	2	<1	<1	65	57	
MW-26	11/02/2019	5.6	<1	<1	190	69	
MW-29	11/07/2019	<1	<1	<1	<6	<6	
MW-30	11/09/2019	<1	<1	<1	11	8.8	Acetone: 32
MW-31	11/05/2019	<1	<1	<1	<6	<6	
MW-32	11/04/2019	<1	<1	<1	20	18	
MW-34	11/08/2019	<1	<1	<1	230	6.8	
MW-37R	11/10/2019	62	2.2	<1	86	88	Bromodichloromethane: 2.7 Chloroform: 4.1
MW-38	11/07/2019	<1	<1	<1	<6	<6	
MW-39	11/04/2019	<1	<1	<1	78	73	
MW-39	11/04/2019-DUP	<1	<1	<1	80	73	
MW-40	11/05/2019	<1	<1	<1	17	16	
MW-41	11/13/2019	<1	<1	<1	33	33	Fe(Dis): <20; Mn(Dis): <2
MW-42	11/08/2019	1.5	<1	<1	27	27	
MW-43	11/08/2019	<1	<1	<1	<6	<6	
MW-44	11/17/2019	<1	<1	<1	<6	<6	

Table 3.2 (cont.): Water-Quality Data from Groundwater Monitoring Program Wells - 2019

Well ID	Sample Date	TCE μg/L	1,1-DCE μg/L	1,1,1-TCA μg/L	Chromium		Additional Compounds ^a
					Total μg/L	Dissolved μg/L	
MW-45	11/10/2019	<1	<1	<1	28	27	Bromodichloromethane: 3.5 Chloroform: 4.6
MW-46	11/15/2019	110	12	<2	39	44	
MW-47R	11/16/2019	<1	<1	<1	<6	<6	
MW-49	11/05/2019	<1	<1	<1	<6	<6	
MW-51	11/19/2019	<1	<1	<1	32	31	
MW-52R	02/09/2019	13	27	<1	<6	NA	
MW-52R	05/05/2019	12	24	<1	<6	NA	
MW-52R	08/03/2019	10	19	<1	<6	NA	
MW-52R	11/06/2019	7.4	13	<1	<6	<6	
MW-52R	11/06/2019-DUP	7.6	14	<1	<6	<6	
MW-53D	11/16/2019	13	<1	<1	7.5	7.1	
MW-54	11/19/2019	<1	<1	<1	350	<6	
MW-55	11/12/2019	10	<1	<1	16	15	
MW-56	11/12/2019	43	1.5	<1	48	47	
MW-57D	02/08/2019	<1	<1	<1	<6	NA	
MW-57D	05/03/2019	<1	<1	<1	<6	NA	
MW-57D	08/02/2019	<1	<1	<1	<6	NA	
MW-57D	11/14/2019	<1	<1	<1	<6	<6	
MW-59	11/19/2019	<1	<1	<1	34	34	
MW-60	11/11/2019	120	4.8	<1	82	28	
MW-62R	02/28/2019	3.6	4.4	<1	<6	<6	Fe(Dis): <20; Mn(Dis): 30
MW-62R	02/28/2019-DUP	3.5	4.6	<1	<6	<6	Fe(Dis): <20; Mn(Dis): 31
MW-62R	05/06/2019	4	5.9	<1	<6	NA	
MW-62R	08/05/2019	3.4	4.8	<1	<6	NA	
MW-62R	11/16/2019	2.9	3.2	<1	<6	<6	
MW-64	11/17/2019	<1	<1	<1	<6	<6	
MW-65	02/10/2019	<1	<1	<1	<6	NA	
MW-65	05/02/2019	<1	<1	<1	<6	NA	
MW-65	08/04/2019	<1	<1	<1	<6	NA	

Table 3.2 (cont.): Water-Quality Data from Groundwater Monitoring Program Wells - 2019

Well ID	Sample Date	TCE μg/L	1,1-DCE μg/L	1,1,1-TCA μg/L	Chromium		Additional Compounds ^a
					Total μg/L	Dissolved μg/L	
MW-65	11/06/2019	<1	<1	<1	<6	<6	
MW-65	02/10/2019-DUP	<1	<1	<1	<6	NA	
MW-65	05/02/2019-DUP	<1	<1	<1	<6	NA	
MW-65	08/04/2019-DUP	<1	<1	<1	<6	NA	
MW-66	02/08/2019	<1	<1	<1	<6	NA	
MW-66	05/03/2019	<1	<1	<1	<6	NA	
MW-66	08/02/2019	<1	<1	<1	<6	NA	
MW-66	11/14/2019	<1	<1	<1	<6	<6	
MW-67	05/06/2019	<1	<1	<1	<6	NA	
MW-67	11/12/2019	<1	<1	<1	<6	<6	
MW-67	11/12/2019-DUP	<1	<1	<1	<6	<6	
MW-68	02/08/2019	<1	<1	<1	<6	NA	
MW-68	05/03/2019	<1	<1	<1	<6	NA	
MW-68	08/02/2019	<1	<1	<1	<6	NA	
MW-68	11/14/2019	<1	<1	<1	<6	<6	
MW-68	11/14/2019	<1	<1	<1	<6	<6	
MW-68	11/14/2019-DUP	<1	<1	<1	<6	<6	
MW-69	02/08/2019	<1	<1	<1	12	NA	
MW-69	05/03/2019	<1	<1	<1	12	NA	
MW-69	08/02/2019	<1	<1	<1	11	NA	
MW-69	11/14/2019	<1	<1	<1	12	11	
MW-70	11/04/2019	<1	<1	<1	<6	<6	
MW-71R	02/12/2019	15	<1	<1	<6	NA	
MW-71R	05/06/2019	10	<1	<1	<6	NA	
MW-71R	08/05/2019	11	<1	<1	<6	NA	
MW-71R	11/11/2019	9.6	<1	<1	<6	<6	
MW-72	11/13/2019	17	1.4	<1	46	46	Fe(Dis): <20; Mn(Dis): <2
MW-73	11/07/2019	8.9	<1	<1	54	54	
MW-79	05/04/2019	<1	<1	<1	<6	NA	
MW-79	11/16/2019	<1	<1	<1	<6	<6	
MW-80	02/13/2019	<1	<1	<1	16	NA	

Table 3.2 (cont.): Water-Quality Data from Groundwater Monitoring Program Wells - 2019

Well ID	Sample Date	TCE μg/L	1,1-DCE μg/L	1,1,1-TCA μg/L	Chromium		Additional Compounds ^a
					Total μg/L	Dissolved μg/L	
MW-80	05/07/2019	<1	<1	<1	18	NA	
MW-80	08/06/2019	<1	<1	<1	15	NA	
MW-80	11/23/2019	<1	<1	<1	16	14	

Concentration exceeds or is equal to the more stringent of the MCL for drinking water or maximum allowable concentration in groundwater set by the NMWQCC (5 μg/L for TCE and DCE, 60 μg/L for TCA and 50 μg/L for Total Chromium)

NA
Not Analyzed

^a Analyte concentrations are reported in μg/L

Table 3.3: Water-Quality Data from Infiltration Gallery and Pond Monitoring - 2019

Well ID	Sample Date	TCE μg/L	1,1-DCE μg/L	1,1,1-TCA μg/L	Cr (total) μg/L	Cr (diss) μg/L	Fe (diss) μg/L	Mn (diss) μg/L
MW-17	02/02/2019	1.2	<1	<1	37	36	<20	<2
MW-17	05/07/2019	<1	<1	<1	35	32	<20	<2
MW-17	08/06/2019	<1	<1	<1	32	33	<20	<2
MW-17	11/02/2019	<1	<1	<1	39	32	22	<2
MW-74	02/07/2019	<1	<1	<1	NA	<6	<20	<2
MW-74	05/04/2019	<1	<1	<1	NA	<6	<20	<2
MW-74	08/03/2019	<1	<1	<1	<6	<6	<20	<2
MW-74	11/15/2019	<1	<1	<1	<6	<6	<20	<2
MW-75	02/07/2019	<1	<1	<1	NA	<6	<20	<2
MW-75	05/04/2019	<1	<1	<1	NA	<6	<20	<2
MW-75	08/03/2019	<1	<1	<1	<6	<6	<20	<2
MW-75	11/15/2019	<1	<1	<1	<6	<6	<20	<2
MW-76	02/07/2019	<1	<1	<1	NA	<6	<20	<2
MW-76	05/04/2019	<1	<1	<1	NA	<6	<20	<2
MW-76	08/03/2019	<1	<1	<1	<6	<6	<20	<2
MW-76	11/15/2019	<1	<1	<1	<6	<6	25	<2
MW-77	02/11/2019	1.1	<1	<1	NA	<6	<20	440
MW-77	05/02/2019	2.4	<1	<1	NA	<6	<20	310
MW-77	08/05/2019	<1	<1	<1	<6	<6	<20	360
MW-77	11/13/2019	1.1	<1	<1	<6	<6	21	350
MW-78	02/11/2019	<1	<1	<1	NA	32	<20	<2
MW-78	02/11/2019-DUP	<1	<1	<1	NA	32	<20	<2
MW-78	05/02/2019	<1	<1	<1	NA	35	<20	<2
MW-78	05/02/2019-DUP	<1	<1	<1	NA	36	<20	<2
MW-78	08/05/2019	<1	<1	<1	34	34	<20	<2
MW-78	08/05/2019-DUP	<1	<1	<1	35	34	<20	<2
MW-78	11/13/2019	<1	<1	<1	30	32	<20	<2
MW-78	11/13/2019-DUP	<1	<1	<1	31	30	<20	<2

Table 3.4: Results of the Fourth Quarter - 2019 1,4-Dioxane Sampling Event

Well ID	Sample Date	1,4-Dioxane μg/L	Laboratory Qualifier	Practical Quantitation Limit μg/L	Method Detection Limit μg/L
CW-1 Effluent	11/01/2019	3.13		1	0.2
CW-1 Influent	11/01/2019	2.33	S12	1	0.2
CW-2 Effluent	11/01/2019	3.58		1	0.2
CW-2 Influent	11/01/2019	2.55	S12	1	0.2
MW-07	11/03/2019	2.19		1	0.2
MW-09	11/03/2019	10.7		1	0.2
MW-12	11/03/2019	11.3		1	0.2
MW-14R	11/05/2019	0.9 J	J	1	0.2
MW-16	11/02/2019	10.4		1	0.2
MW-17	11/02/2019	3.17		1	0.2
MW-18	11/02/2019	3.12		1	0.2
MW-19	11/07/2019	5.94		1	0.2
MW-20	11/07/2019	<1	ND	1	0.2
MW-20	11/07/2019-DUP	<1	ND	1	0.2
MW-21	11/08/2019	3.54		1	0.2
MW-22	11/04/2019	2.41		1	0.2
MW-23	11/03/2019	8.43		1	0.2
MW-25	11/08/2019	<1	ND	1	0.2
MW-26	11/02/2019	3.32		1	0.2
MW-29	11/07/2019	<1	ND	1	0.2
MW-30	11/09/2019	<1	ND	1	0.2
MW-31	11/05/2019	0.41 J	J	1	0.2
MW-32	11/04/2019	1.47	S12	1	0.2
MW-34	11/08/2019	3.3		1	0.2
MW-37R	11/10/2019	4.4		1	0.2
MW-38	11/07/2019	<1	ND	1	0.2
MW-39	11/04/2019	<1	ND	1	0.2
MW-39	11/04/2019-DUP	<1	ND	1	0.2
MW-40	11/05/2019	<1	ND	1	0.2
MW-41	11/13/2019	4.64		1	0.2
MW-42	11/08/2019	4.83		1	0.2
MW-43	11/08/2019	2.37		1	0.2
MW-44	11/17/2019	<1	ND	1	0.2
MW-45	11/10/2019	<1	ND	1	0.2
MW-46	11/15/2019	19.6		1	0.2
MW-47R	11/16/2019	<1	ND	1	0.2
MW-49	11/05/2019	<1	ND	1	0.2
MW-51	11/19/2019	4.54		1	0.2
MW-52R	11/06/2019	0.8		1	0.2
MW-52R	11/06/2019-DUP	0.79		1	0.2
MW-53D	11/16/2019	0.62		1	0.2

Table 3.4 (cont.): Results of the Fourth Quarter - 2019 1,4-Dioxane Sampling Event

Well ID	Sample Date	1,4-Dioxane $\mu\text{g/L}$	Laboratory Qualifier	Practical Quantitation Limit $\mu\text{g/L}$	Method Detection Limit $\mu\text{g/L}$
MW-54	11/19/2019	<1	ND	1	0.2
MW-55	11/12/2019	<1	ND	1	0.2
MW-56	11/12/2019	2.11		1	0.2
MW-57D	11/14/2019	<1	ND	1	0.2
MW-59	11/19/2019	4.94		1	0.2
MW-60	11/11/2019	18.8		1	0.2
MW-62R	11/16/2019	<1	ND	1	0.2
MW-63	12/05/2019	<1	ND	1	0.2
MW-64	11/17/2019	<1	ND	1	0.2
MW-65	11/06/2019	<1	ND	1	0.2
MW-66	11/14/2019	<1	ND	1	0.2
MW-67	11/12/2019	<1	ND	1	0.2
MW-67	11/12/2019-DUP	<1	ND	1	0.2
MW-68	11/14/2019	0.44 J	J	1	0.2
MW-68	11/14/2019-DUP	0.41 J	J	1	0.2
MW-69	11/14/2019	7.33		1	0.2
MW-70	11/04/2019	<1	ND	1	0.2
MW-71R	11/11/2019	0.6 J	J	1	0.2
MW-72	11/13/2019	17.4		1	0.2
MW-73	11/07/2019	7.56		1	0.2
MW-74	11/15/2019	5.19		1	0.2
MW-75	11/15/2019	4.07		1	0.2
MW-76	11/15/2019	4.54		1	0.2
MW-77	11/13/2019	1.78		1	0.2
MW-78	11/13/2019	4.36		1	0.2
MW-78	11/13/2019-DUP	4.51		1	0.2
MW-79	11/16/2019	<1	ND	1	0.2
MW-80	11/23/2019	11.3		1	0.2

ND Non-detect, Below the method detection

J Reported value is between the laboratory detection limit and practical quantitation limit

S12 Surrogate recovery was low

Concentration exceeds the New Mexico standard of 4.59 $\mu\text{g/L}$

Table 3.5: Containment System Flow Rates - 2019

Month	Off-Site Containment Well		Source Containment Well		Total	
	Volume Pumped (gal)	Average Rate (gpm)	Volume Pumped (gal)	Average Rate (gpm)	Volume Pumped (gal)	Average Rate (gpm)
Jan	13,481,070	302	2,787,830	62	16,268,900	364
Feb	12,177,674	302	2,469,192	61	14,646,866	363
Mar	13,486,662	302	2,750,918	62	16,237,580	364
Apr	13,054,024	302	2,620,382	61	15,674,406	363
May	13,222,132	296	2,658,268	60	15,880,400	356
Jun	13,058,570	302	2,497,956	58	15,556,526	360
Jul	13,477,649	302	2,443,013	55	15,920,662	357
Aug	13,493,159	302	2,302,181	52	15,795,340	354
Sep	13,057,263	302	2,370,939	55	15,428,202	357
Oct	13,494,948	302	2,410,231	54	15,905,179	356
Nov	12,514,017	290	2,261,543	52	14,775,560	342
Dec	13,464,181	302	2,503,640	56	15,967,821	358
Annual Total or Average	157,981,349	301	30,076,093	57	188,057,442	358

Table 3.6: Influent and Effluent Quality for the Off-Site Containment Well System - 2019
(a) Influent

Sampling Date	Concentration (µg/L)						
	TCE	DCE	TCA	Cr Total	Cr Dissolved	Fe Dissolved	Mn Dissolved
01/02/2019	150	21	<1	6.1	NA	NA	NA
02/01/2019	200	24	<1	6	NA	NA	NA
03/01/2019	150	17	<1	<6	<6	<20	<2
04/01/2019	170	19	<1	<6	<6	<20	<2
05/01/2019	160	18	<1	<6	<6	<20	<2
06/01/2019	130	17	<1	<6	<6	<20	<2
07/01/2019	170	20	<1	<6	<6	<20	<2
08/01/2019	140	20	<1	<6	<6	<20	<2
09/01/2019	150	18	<1	<6	6.1	<20	<2
10/01/2019	150	18	<1	<6	<6	<20	<2
11/01/2019	140	17	<1	6.4	<6	<20	<2
12/01/2019	110	11	<1	<6	<6	<20	<2
01/02/2020	110	14	<1	<6	<6	<20	<2

(b) Effluent

Sampling Date	Concentration (µg/L)						
	TCE	DCE	TCA	Cr Total	Cr Dissolved	Fe Dissolved	Mn Dissolved
01/02/2019	<1	<1	<1	6.2	NA	NA	NA
02/01/2019	<1	<1	<1	<6	NA	NA	NA
03/01/2019	<1	<1	<1	<6	<6	<20	<2
04/01/2019	<1	<1	<1	<6	6.6	<20	<2
05/01/2019	<1	<1	<1	<6	<6	<20	<2
06/01/2019	<1	<1	<1	<6	<6	<20	<2
07/01/2019	<1	<1	<1	<6	<6	<20	<2
08/01/2019	<1	<1	<1	<6	<6	<20	<2
09/01/2019	<1	<1	<1	<6	<6	<20	<2
10/01/2019	<1	<1	<1	<6	<6	<20	<2
11/01/2019	<1	<1	<1	6.6	<6	<20	<2
12/01/2019	<1	<1	<1	<6	<6	<20	<2
01/02/2020	<1	<1	<1	<6	<6	<20	<2

Concentration exceeds or is equal to the more stringent of the MCL for drinking water or maximum allowable concentration in groundwater set by the NMWQCC (5 µg/L for TCE and DCE, 60 µg/L for TCA and 50 µg/L for Total Chromium)

NA Not Analyzed

Table 3.7: Influent and Effluent Quality for the Source Containment Well System - 2019
(a) Influent

Sampling Date	Concentration (µg/L)						
	TCE	DCE	TCA	Cr Total	Cr Dissolved	Fe Dissolved	Mn Dissolved
01/02/2019	6.9	<1	<1	58	NA	NA	NA
02/01/2019	8.2	<1	<1	53	NA	NA	NA
03/01/2019	6.3	<1	<1	54	54	<20	38
04/01/2019	8.2	<1	<1	54	50	<20	33
05/01/2019	7.8	<1	<1	53	52	<20	36
06/01/2019	6.6	<1	<1	50	49	<20	34
07/01/2019	7.9	<1	<1	51	51	<20	34
08/01/2019	7.9	<1	<1	51	49	<20	32
09/01/2019	6.9	<1	<1	49	51	<20	33
10/01/2019	7	<1	<1	51	49	<20	63
11/01/2019	6.8	<1	<1	50	49	<20	59
12/01/2019	5.9	<1	<1	48	47	<20	47
01/02/2020	4.7	<1	<1	44	45	<20	33

(b) Effluent

Sampling Date	Concentration (µg/L)						
	TCE	DCE	TCA	Cr Total	Cr Dissolved	Fe Dissolved	Mn Dissolved
01/02/2019	<1	<1	<1	37	NA	NA	NA
02/01/2019	<1	<1	<1	34	NA	NA	NA
03/01/2019	<1	<1	<1	37	34	<20	26
04/01/2019	<1	<1	<1	35	33	<20	19
05/01/2019	<1	<1	<1	39	38	<20	22
06/01/2019	<1	<1	<1	38	40	<20	22
07/01/2019	<1	<1	<1	38	37	<20	21
08/01/2019	<1	<1	<1	38	38	<20	20
09/01/2019	<1	<1	<1	37	37	<20	22
10/01/2019	<1	<1	<1	38	37	<20	40
11/01/2019	<1	<1	<1	38	38	<20	37
12/01/2019	<1	<1	<1	36	34	<20	29
01/02/2020	<1	<1	<1	34	33	<20	20

Concentration exceeds or is equal to the more stringent of the MCL for drinking water or maximum allowable concentration in groundwater set by the NMWQCC (5 µg/L for TCE and DCE, 60 µg/L for TCA and 50 µg/L for Total Chromium)

Table 3.8: Chromium Concentration, Flow Rate, and Other Data from Treatment Plant - 2019

Date	Chromium Concentration (µg/L)				Flow Rate (gpm)		Comments
	Influent	Mid-Tank	Effluent from 2nd Tank	Effluent from Stripper	CW-2	Diversion to Chromium Unit	
01/01/2019	NS	NS	NS	NS	62.1	27.0	
01/02/2019	58	NS	NS	37	62.1	27.0	
01/03/2019	56	NS	1.1	39	61.9	27.2	Tank Exchange No.71
01/05/2019	NS	NS	NS	NS	62.3	27.9	
01/10/2019	NS	NS	NS	NS	62.3	26.9	
01/15/2019	NS	NS	NS	NS	62.5	26.9	
01/20/2019	NS	NS	NS	NS	62.5	25.4	
01/25/2019	NS	NS	NS	NS	62.6	26.9	
01/30/2019	NS	NS	NS	NS	62.8	27.1	
01/31/2019	51	NS	<6	33	61.5	26.7	Tank Exchange No.72
02/01/2019	53	NS	NS	34	62.8	27.1	
02/05/2019	NS	NS	NS	NS	62.9	27.1	
02/10/2019	NS	NS	NS	NS	34.9	15.0	
02/15/2019	NS	NS	NS	NS	61.8	26.7	
02/20/2019	NS	NS	NS	NS	62.0	27.0	
02/25/2019	NS	NS	NS	NS	61.7	26.9	
02/28/2019	56	NS	<6	36	60.9	26.7	Tank Exchange No.73
03/01/2019	54	NS	NS	37	61.5	26.9	
03/05/2019	NS	NS	NS	NS	61.5	27.0	
03/10/2019	NS	NS	NS	NS	61.6	26.8	
03/15/2019	NS	NS	NS	NS	61.7	27.3	
03/20/2019	NS	NS	NS	NS	61.5	26.3	
03/25/2019	NS	NS	NS	NS	61.8	26.9	
03/30/2019	NS	NS	NS	NS	61.1	26.3	
03/31/2019	NS	NS	NS	NS	61.1	26.2	
04/01/2019	54	NS	NS	35	61.1	26.7	
04/02/2019	52	NS	<6	34	60.6	26.6	Tank Exchange No.74
04/05/2019	NS	NS	NS	NS	61.2	27.0	
04/10/2019	NS	NS	NS	NS	61.2	26.9	
04/15/2019	NS	NS	NS	NS	60.6	23.8	
04/20/2019	NS	NS	NS	NS	60.3	18.9	
04/25/2019	NS	NS	NS	NS	60.3	19.7	
04/30/2019	NS	NS	NS	NS	59.7	20.1	
05/01/2019	53	NS	NS	39	59.7	20.1	
05/02/2019	NS	NS	NS	NS	58.9	20.0	Tank Exchange No.75
05/03/2019	NS	NS	<6	NS	59.6	20.4	
05/05/2019	NS	NS	NS	NS	59.6	20.0	
05/10/2019	NS	NS	NS	NS	59.5	20.0	
05/15/2019	NS	NS	NS	NS	59.9	20.4	
05/20/2019	NS	NS	NS	NS	59.7	20.4	
05/25/2019	NS	NS	NS	NS	59.4	20.4	
05/30/2019	NS	NS	NS	NS	59.1	20.3	
05/31/2019	NS	NS	NS	NS	59.0	20.2	
06/01/2019	50	NS	NS	38	59.0	20.0	
06/05/2019	NS	NS	NS	NS	58.7	19.8	

Table 3.8 (cont.): Chromium Concentration, Flow Rate, and Other Data from Treatment Plant - 2019

Date	Chromium Concentration (µg/L)				Flow Rate (gpm)		Comments
	Influent	Mid-Tank	Effluent from 2nd Tank	Effluent from Stripper	CW-2	Diversion to Chromium Unit	
06/06/2019	51	NS	<6	38	58.0	20.7	Tank Exchange No.76
06/10/2019	NS	NS	NS	NS	58.4	21.8	
06/15/2019	NS	NS	NS	NS	57.9	20.1	
06/20/2019	NS	NS	NS	NS	57.4	19.9	
06/25/2019	NS	NS	NS	NS	56.9	19.9	
06/30/2019	NS	NS	NS	NS	56.2	19.8	
07/01/2019	51	NS	NS	38	56.1	20.0	
07/05/2019	NS	NS	NS	NS	55.7	19.8	
07/10/2019	NS	NS	NS	NS	55.4	20.5	
07/11/2019	51	NS	<6	36	54.6	25.0	Tank Exchange No.77
07/15/2019	NS	NS	NS	NS	55.0	23.8	
07/20/2019	NS	NS	NS	NS	54.2	20.1	
07/25/2019	NS	NS	NS	NS	53.7	20.0	
07/30/2019	NS	NS	NS	NS	53.2	19.9	
07/31/2019	NS	NS	NS	NS	53.1	19.7	
08/01/2019	51	NS	NS	38	53.0	19.9	
08/05/2019	NS	NS	NS	NS	52.7	19.1	
08/10/2019	NS	NS	NS	NS	51.7	11.1	
08/15/2019	49	NS	<6	36	51.3	20.5	Tank Exchange No.78
08/20/2019	NS	NS	NS	NS	51.5	20.6	
08/25/2019	NS	NS	NS	NS	50.7	19.9	
08/30/2019	NS	NS	NS	NS	49.6	20.6	
08/31/2019	NS	NS	NS	NS	49.3	20.2	
09/01/2019	49	NS	NS	37	49.2	20.2	
09/05/2019	NS	NS	NS	NS	56.3	17.0	
09/10/2019	NS	NS	NS	NS	56.4	19.8	
09/15/2019	NS	NS	NS	NS	56.0	20.0	
09/19/2019	53	NS	<6	38	54.5	20.5	Tank Exchange No.79
09/20/2019	NS	NS	NS	NS	55.5	21.8	
09/25/2019	NS	NS	NS	NS	54.8	20.1	
09/30/2019	NS	NS	NS	NS	54.1	20.2	
10/01/2019	51	NS	NS	38	54.0	20.2	
10/05/2019	NS	NS	NS	NS	53.4	20.0	
10/10/2019	NS	NS	NS	NS	52.8	20.2	
10/15/2019	NS	NS	NS	NS	52.3	20.2	
10/20/2019	NS	NS	NS	NS	55.8	18.7	
10/24/2019	50	NS	<6	38	55.3	20.6	Tank Exchange No.80
10/25/2019	NS	NS	NS	NS	55.7	21.4	
10/30/2019	NS	NS	NS	NS	55.2	20.3	
10/31/2019	NS	NS	NS	NS	55.1	20.2	
11/01/2019	50	NS	NS	38	55.0	20.2	
11/05/2019	NS	NS	NS	NS	54.7	20.1	
11/10/2019	NS	NS	NS	NS	54.5	20.0	
11/15/2019	NS	NS	NS	NS	54.4	20.2	
11/20/2019	NS	NS	NS	NS	54.6	20.2	

**Table 3.8 (cont.): Chromium Concentration, Flow Rate, and Other Data from Treatment Plant - 2019**

Date	Chromium Concentration ($\mu\text{g/L}$)				Flow Rate (gpm)		Comments
	Influent	Mid-Tank	Effluent from 2nd Tank	Effluent from Stripper	CW-2	Diversion to Chromium Unit	
11/25/2019	NS	NS	NS	NS	54.8	19.9	
11/30/2019	NS	NS	NS	NS	54.9	18.2	
12/01/2019	48	NS	NS	36	55.1	18.8	
12/05/2019	NS	NS	<6	NS	54.9	20.8	Tank Exchange No.81
12/10/2019	NS	NS	NS	NS	55.8	20.8	
12/15/2019	NS	NS	NS	NS	56.1	20.8	
12/20/2019	NS	NS	NS	NS	56.3	19.8	
12/25/2019	NS	NS	NS	NS	56.4	19.7	
12/30/2019	NS	NS	NS	NS	56.6	20.5	
12/31/2019	NS	NS	NS	NS	56.7	20.5	



Monthly Sampling Event

Concentration exceeds or is equal to the more stringent of the MCL for drinking water or maximum allowable concentration in groundwater set by the NMWQCC (50 $\mu\text{g/L}$ for Total Chromium)

NS Not Sampled

Table 4.1: Concentration Changes in Monitoring Wells - 1998 to 2019

Well ID	Change in Concentration (µg/L)		
	TCE	DCE	Cr
CW-1	0	14.1	-23 ^c
CW-2 ^a	-993	-190	43.3
MW-07	-63	-15	5
MW-09	-278	-19	494
MW-12	-370	-26	-12.7
MW-14R ^b	-429	-24	83
MW-16	-1192	-30	69
MW-17	-68	-3.5	-718
MW-18	-600	-50	32
MW-19	14.8	1.3	51 ^c
MW-20	0	0	0 ^c
MW-21	-7.5	0	34
MW-22	-13	-2	36 ^c
MW-23	-6197	-400	16
MW-25	-5598	-73	-353
MW-26	-6494	-590	26
MW-29	0	0	0 ^c
MW-30	-5.4	0	-16.2 ^c
MW-31	0	0	-14 ^c
MW-32	-550	-96	18 ^c
MW-34	0	0	-153 ^c
MW-37R ^b	-928	-45.8	88
MW-38	0	0	0 ^c
MW-39	0	0	-97 ^c
MW-40	0	0	5 ^c
MW-41	-170	-26	33 ^c
MW-42	-368	-48	27 ^c
MW-43	-25	-5.1	0 ^c
MW-44	-1.3	0	0 ^c
MW-45	-40	-1.7	-13 ^c

Well ID	Change in Concentration (µg/L)		
	TCE	DCE	Cr
MW-46	-2090	-118	44 ^c
MW-47R ^b	-34	-1.2	-40 ^c
MW-49	0	0	0 ^c
MW-51	0	0	31 ^c
MW-52R ^b	7.4	13	0 ^c
MW-53D ^b	-86	-3.4	-62.9 ^c
MW-55	-380	-10	-165 ^c
MW-56	-97	-3.2	-23 ^c
MW-57D ^b	0	0	0
MW-59	0	0	34 ^c
MW-60	-7580	-345	28 ^c
MW-62R ^b	0.9	-3.4	-7 ^c
MW-64	0	0	0 ^c
MW-65	-13	0	0 ^c
MW-66	0	0	0 ^c
MW-67	0	0	-40 ^c
MW-68	0	0	0 ^c
MW-69	0	0	11 ^c
MW-70	0	0	0 ^c
MW-71R ^b	-46.4	-1.6	0 ^c
MW-72 ^a	-1783	-219	-104 ^c
MW-73 ^a	-3991	-520	-46 ^c
MW-74	0	0	-21 ^c
MW-75	0	0	0 ^c
MW-76	0	0	0 ^c
MW-77 ^a	-14.9	-1.2	0
MW-78 ^a	-6	0	32
MW-79 ^a	0	0	0 ^c
MW-80 ^a	0	0	14 ^c

a Change in concentration from first available sample

b Change in concentration from original well

c Change in concentration based on initial Total Chromium and current Dissolved Chromium

0 "0" indicates concentration below detection limits during both sampling events

Well used in both the initial and the current plume definition for TCE, DCE and Chromium

Well used in the initial and the current plume definition for only one or two of the three constituents

Well used either in the initial or the current plume definition

Table 4.2: Summary Containment System Flow Rates - 1998 to 2019

Month	Off-Site Containment Well		Source Containment Well		Total	
	Volume Pumped (gal)	Average Rate (gpm)	Volume Pumped (gal)	Average Rate (gpm)	Volume Pumped (gal)	Average Rate (gpm)
1998 ^a	1,694,830				1,694,830	
1999	114,928,700	219			114,928,700	219
2000	114,094,054	217			114,094,054	216
2001	113,654,183	216			113,654,183	216
2002	116,359,389	221	25,403,490	48	141,762,879	270
2003	118,030,036	225	27,292,970	52	145,323,006	276
2004	113,574,939	216	26,105,202	50	139,680,141	265
2005	118,018,628	225	25,488,817	48	143,507,445	273
2006	112,213,088	213	24,133,213	46	136,346,301	259
2007	117,098,422	223	23,983,802	46	141,082,224	268
2008	114,692,635	218	25,432,013	48	140,124,648	266
2009	114,752,782	218	24,524,740	47	139,277,522	265
2010	147,736,408	281	16,484,367	31	164,220,775	312
2011	149,171,757	284	26,989,781	51	176,161,538	335
2012	151,260,826	288	22,133,042	42	173,393,868	329
2013	147,736,408	281	16,484,367	31	164,220,775	312
2014	152,775,148	291	16,293,181	31	169,068,329	322
2015	152,187,068	290	25,906,559	49	178,093,627	339
2016	145,904,897	278	26,361,513	50	172,266,410	327
2017	157,208,682	299	23,913,302	45	181,121,984	345
2018	153,801,952	293	28,775,355	55	182,577,307	347
2019	157,981,349	301	30,076,093	57	188,057,442	358
Total or Average	2,784,876,180	252	435,781,808	39	3,220,657,988	292

a Volume pumped during the testing of the well in early December, and during the first day of operation on December 31, 1998

Table 4.3: VOC Mass Removal - 2019

(a) Total

Year	Mass Removed	kg	lbs
2019	TCE	90.47	199.45
	DCE	10.85	23.92
	Total	101.32	223.37

(b) Off-Site Containment System

Month	Mass Removed				Total	
	TCE		DCE			
	kg	lbs	kg	lbs	kg	lbs
Jan	8.9	19.7	1.15	2.53	10.1	22.2
Feb	8.1	17.8	0.94	2.08	9.0	19.9
Mar	8.2	18.0	0.92	2.03	9.1	20.0
Apr	8.2	18.0	0.91	2.02	9.1	20.0
May	7.3	16.0	0.88	1.93	8.1	17.9
Jun	7.4	16.3	0.91	2.02	8.3	18.4
Jul	7.9	17.4	1.02	2.25	8.9	19.7
Aug	7.4	16.3	0.97	2.14	8.4	18.5
Sep	7.4	16.3	0.89	1.96	8.3	18.3
Oct	7.4	16.3	0.89	1.97	8.3	18.3
Nov	5.9	13.1	0.66	1.46	6.6	14.5
Dec	5.6	12.4	0.64	1.40	6.2	13.8
Total	89.7	197.7	10.79	23.79	100.4	221.4

(c) Source Containment System

Month	Mass Removed				Total	
	TCE		DCE			
	kg	lbs	kg	lbs	kg	lbs
Jan	0.080	0.176	0.005	0.012	0.085	0.187
Feb	0.068	0.149	0.005	0.010	0.072	0.160
Mar	0.075	0.166	0.005	0.011	0.081	0.178
Apr	0.079	0.175	0.005	0.011	0.084	0.186
May	0.072	0.160	0.005	0.011	0.077	0.171
Jun	0.069	0.151	0.005	0.010	0.073	0.162
Jul	0.073	0.161	0.005	0.010	0.078	0.171
Aug	0.064	0.142	0.004	0.010	0.069	0.152
Sep	0.062	0.138	0.004	0.010	0.067	0.147
Oct	0.063	0.139	0.005	0.010	0.068	0.149
Nov	0.054	0.120	0.004	0.009	0.059	0.129
Dec	0.050	0.111	0.005	0.010	0.055	0.121
Total	0.811	1.787	0.057	0.125	0.868	1.913



Table 4.4: Summary of VOC Mass Removal - 1998 to 2019

(a) Total

Year	Mass Removed							
	TCE		DCE		TCA		Total	
	kg	lbs	kg	lbs	kg	lbs	kg	lbs
1998 ^a	1.31	2.88	0.0300	0.0661	0	0	1.34	2.95
1999	358	788	16.2	35.7	0	0	374	824
2000	463	1,020	23.3	51.4	0	0	486	1,070
2001	519	1,140	26.6	58.7	0	0	546	1,200
2002	603	1,330	40.6	89.5	3.66	8.08	647	1,430
2003	617	1,360	38.2	84.1	3.05	6.73	658	1,450
2004	595	1,310	35.2	77.7	2.43	5.37	633	1,400
2005	558	1,230	34.6	76.4	2.01	4.43	594	1,310
2006	512	1,130	34.3	75.7	1.67	3.68	548	1,210
2007	468	1,030	32.9	72.6	1.04	2.29	502	1,110
2008	434	956	32.5	71.7	1.08	2.39	467	1,030
2009	378	833	31.9	70.4	1.23	2.71	411	906
2010	309	682	29.2	64.3	0.967	2.13	339	748
2011	351	774	34.8	76.7	1.16	2.56	387	854
2012	285	629	31.8	70.2	0.975	2.15	318	701
2013	233	513	27.0	59.6	0.736	1.62	260	574
2014	209	460	25.1	55.3	0.338	0.745	234	516
2015	173	380	21.3	47.1	NC	NC	194	427
2016	141	310	17.1	37.6	NC	NC	158	348
2017	138	304	16.6	36.6	NC	NC	155	341
2018	115	253	14.1	31.2	NC	NC	129	284
2019	90.5	199	10.8	23.9	NC	NC	101	223
Total	7,550	16,600	574	1,270	20.4	44.9	8,140	18,000

Table 4.4 (cont.): Summary of VOC Mass Removal - 1998 to 2019

(b) Off-Site Containment System

Year	Mass Removed							
	TCE		DCE		TCA		Total	
	kg	lbs	kg	lbs	kg	lbs	kg	lbs
1998 ^a	1.31	2.88	0.0300	0.0661	0	0	1.34	2.95
1999	358	788	16.2	35.7	0	0	374	824
2000	463	1,020	23.3	51.4	0	0	486	1,070
2001	519	1,140	26.6	58.7	0	0	546	1,200
2002	543	1,200	30.9	68.2	2.05	4.52	576	1,270
2003	568	1,250	31.6	69.7	2.06	4.55	602	1,330
2004	567	1,250	31.7	69.8	1.97	4.34	600	1,320
2005	540	1,190	32.4	71.3	1.79	3.95	574	1,270
2006	499	1,100	32.6	71.8	1.58	3.47	533	1,170
2007	456	1,010	31.5	69.4	1.04	2.29	489	1,080
2008	425	937	31.5	69.4	1.08	2.39	458	1,010
2009	372	820	31.2	68.7	1.23	2.71	404	892
2010	305	673	28.6	63.1	0.967	2.13	335	738
2011	348	766	34.4	75.8	1.16	2.56	383	845
2012	283	623	31.6	69.6	0.975	2.15	315	695
2013	231	509	26.8	59.2	0.736	1.62	259	570
2014	207	457	25.0	55.1	0.338	0.745	232	512
2015	171	377	21.2	46.7	NC	NC	192	424
2016	139	307	16.9	37.3	NC	NC	156	344
2017	137	302	16.5	36.4	NC	NC	153	338
2018	114	251	14.1	31.0	NC	NC	128	282
2019	89.7	198	10.8	23.8	NC	NC	101	222
Total	7,330	16,200	545	1,200	17.6	38.8	7,900	17,400

(c) Source Containment System

Year	Mass Removed							
	TCE		DCE		TCA		Total	
	kg	lbs	kg	lbs	kg	lbs	kg	lbs
2002	59.6	131	9.66	21.3	1.61	3.56	70.9	156
2003	48.7	107	6.53	14.4	0.989	2.18	56.2	124
2004	28.9	63.7	3.56	7.85	0.464	1.02	32.9	72.5
2005	18.1	39.9	2.28	5.03	0.218	0.481	20.6	45.4
2006	13.8	30.5	1.74	3.84	0.0933	0.206	15.7	34.6
2007	11.6	25.6	1.45	3.19	0.00368	0.00812	13.0	28.8
2008	8.42	18.6	1.04	2.29	NC	NC	9.46	20.9
2009	5.91	13.0	0.763	1.68	NC	NC	6.68	14.7
2010	4.30	9.48	0.573	1.26	NC	NC	4.87	10.7
2011	3.52	7.75	0.413	0.911	NC	NC	3.93	8.66
2012	2.53	5.58	0.289	0.638	NC	NC	2.82	6.22
2013	1.54	3.40	0.170	0.375	NC	NC	1.71	3.77
2014	1.52	3.35	0.105	0.231	NC	NC	1.63	3.58
2015	1.52	3.35	0.144	0.317	NC	NC	1.66	3.66
2016	1.38	3.05	0.123	0.271	NC	NC	1.51	3.32
2017	1.02	2.26	0.0760	0.168	NC	NC	1.10	2.43
2018	0.896	1.98	0.0576	0.127	NC	NC	0.954	2.10
2019	0.811	1.79	0.0569	0.125	NC	NC	0.868	1.91
Total	214	472	29.0	64.0	3.38	7.46	247	543

a Volume pumped during the testing of the well in early December, and during the first day of operation on December 31, 1998

NC Not Calculated; concentration reported as being below detection limits

Table 4.5: Chromium Mass Removal - 2019

Source Containment System		
Month	Mass Removed	
	kg	lbs
Jan	0.211	0.465
Feb	0.168	0.371
Mar	0.187	0.413
Apr	0.164	0.361
May	0.131	0.288
Jun	0.118	0.261
Jul	0.120	0.265
Aug	0.109	0.240
Sep	0.112	0.247
Oct	0.114	0.251
Nov	0.103	0.226
Dec	0.104	0.230
Total	1.642	3.620

Table 4.6: Summary of Chromium Mass Removal - 1998 to 2019

(a) Total		
Year	Mass Removed	
	kg	lbs
2000	0.028	0.062
2001	1.829	4.032
-	-	-
-	-	-
2014	3.481	7.674
2015	6.068	13.378
2016	7.195	15.862
2017	5.050	11.133
2018	2.358	5.199
2019	1.642	3.620
Total	27.651	60.960

(b) Off-Site Containment System		
Year	Mass Removed	
	kg	lbs
2000	0.028	0.062
2001	1.829	4.032
Total	1.857	4.094

(c) Source Containment System		
Year	Mass Removed	
	kg	lbs
2014	3.481	7.674
2015	6.068	13.378
2016	7.195	15.862
2017	5.050	11.133
2018	2.358	5.199
2019	1.642	3.620
Total	25.794	56.866

ATTACHMENT

Attachment

Laboratory Reports - 2019
